OCTOBER, 1959 • 35¢

AMERICAN

Cinematographer

SERVING ALL FIELDS OF MOTION PICTURE PRODUCTION

The Magazine of Motion Picture Photography



In This Issue:

- The Photography of "Ben Hur"
- A Block-and-white Traveling Matte Process
- Importance of "Reference White" in TV Films

ALSO TECHNICAL BULLETINS & BOOKS • WHAT'S NEW • INDUSTRY NEWS



Fast action, undersea location. This blow up of a scene from Ivan Tors' production, "Underwater Warrior," shows how Du Pont "Superior" 4 can give you good action shots in any light. Mr Tors, shown at right ready to dive, always accompanies his actors, directors and crew when filming underwater.

"Shooting 'SEA HUNT' we need the exceptional speed of 'Superior' 4"

says Ivan Tors, **producer of the TV series, "SEA HUNT," for ZIV Television Programs, Inc., and "Underwater Warrior," released by MGM.**

"These pictures wouldn't have been possible without Du Pont 'Superior' 4," states Mr. Tors. "Its high speed and wide latitude make it ideal for underwater sequences. With 'Superior' 4 in the camera, we know that anything we see with our own eyes the camera can see better."

And Mr. Tors *does* see it with his own eyes. Whenever he shoots underwater, he and his secretary, both expert divers, go down with the director, lighting men and actor-divers. He's right on the spot and knows from firsthand experience the problems that can come up in submarine cinematography.

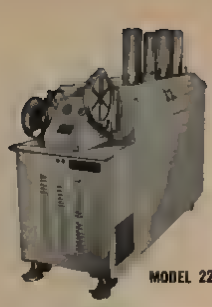
"Talk about tough locations—most of them are child's play when compared to the bottom of the sea," he says. "The light's strange, you have to use special cameras that are pretty tricky and, if your shot's not right the first time, re-shooting can be awfully expensive. You've got to have a film you can depend on—that's why I always use Du Pont 'Superior' 4."

For more information about Du Pont Superior® 4 Motion Picture Film and other fine negative and positive films, contact the nearest Sales Office or write Du Pont Photo Products Department, 2432-A Nemours Building, Wilmington 98, Delaware. In Canada: Du Pont of Canada Limited, Toronto.

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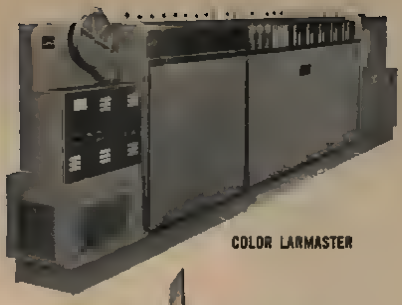
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(Many additional models not shown)

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22	16mm	B&W	Reversal	0 to 35
22B	16mm	B&W	Neg Pos	0 to 45
Labmaster	16mm	B&W	Reversal	0 to 15
Labmaster	16mm	B&W	Neg Pos	0 to 20
Color Labmaster	16mm	Color	Anscochrome	0 to 15
Color Labmaster	16mm	Color	7255 Ektachrome and Anscochrome	0 to 40
100NPC	16mm	Color	Eastman Neg Pos	0 to 100
22BC	16/35mm	B&W	Neg Pos	0 to 22
120PN	16/35mm	B&W	Neg Pos	0 to 120
DC-30	16/35mm	Color	Ektachrome Anscochrome	0 to 30
NP20C	16/35mm	Color	Ektachrome Neg Pos	0 to 20
45NPC	16/35mm	Color	Eastmen Neg Pos	0 to 45
S120PN Spray	16/35mm	B&W	Neg Pos	0 to 150
10C	35mm	B&W	Neg Pos	0 to 40
30NPC70	35/70mm	B&W	Neg Pos	0 to 30
P-70	70mm	B&W	Neg Pos	0 to 20
20RC70P	35/70mm	Color	Ansco Neg Pos Rev	0 to 20
20RC70M	35/70mm	Color	Ektachrome Neg Pos	0 to 20
A-25	5"/9½"	B&W	Film & Paper	0 to 18
A-6	9½"	B&W	Film & Paper	0 to 48
DAC 20	21"	B&W	Ortho Pos.	0 to 20

Whatever your requirements for processing motion picture film or any type of continuous film or paper, Houston Fearless either builds a machine to do the job with maximum efficiency and dependability or will design one for your specific needs. Listed at the left are just a few of the hundreds of types of H-F machines

For more than 31 years, Houston Fearless has been the leading manufacturer of processors for the motion picture industry, television, military and industrial installations This wealth of experience is engineered into every machine

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AMERICAN
Cinematographer

October, 1959 • Vol. 40, No. 10

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•

ON THE COVER

MILTON KRASNER, A.S.C. (immediately behind camera) and his crew line up camera to shoot scene on location for MGM's Home From The Hill directed by Vincente Minnelli (left of Krasner) and starring George Hamilton and Luana Patten—the latter reclining at far right. Note how all equipment—camera, booster light and microphone—are moved in close for the shot.

• *In This Issue*

THE PHOTOGRAPHY OF "BEN HUR" 604
Some highlights on the filming of MGM's biggest film production in Italy. By Libero Grandi

FOG MAKER 606
Compact, portable machine creates fog for movie scenes synthetically

CLOUDS MADE TO ORDER 611
How synthetic clouds are superimposed on exterior scenes as they are being photographed. By Charles G. Clarke, ASC

A BLACK-&-WHITE TRAVELING MATTE PROCESS 612
A description of the system currently in use at Pinewood studios in England. By Robert L. Hoult, FRPS, FBKS

IMPORTANCE OF 'REFERENCE WHITE' IN FILMS FOR TV 614
Providing a key for the video engineer to guide him in setting his controls for proper transmission of television commercials

COLOR IN MOTION PICTURES AND TV 616
Part II. Natural color on film. By Robert Allen Mitchell

BLUEPRINTING THE BUSINESS FILM 619
How careful pre-production planning saves money for industrial and business film producers. By Charles Loring

SIMPLIFYING THE SYNC PROBLEM 620
Signal recorded on tape edge keeps camera in sync with the recorder

• *Features*

INDUSTRY NEWS 582
News briefs of industry activities and progress

WHAT'S NEW IN EQUIPMENT, ACCESSORIES, SERVICES 586
Things that are new for makers of motion pictures

PHOTOGRAPHIC ASSIGNMENTS 594
Where and what TV and feature film cameramen were shooting last month

TECHNICAL QUESTIONS AND ANSWERS 602
Readers' questions answered by experts

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VICOM INC
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2 RUE RICHER
PARIS, FRANCE

INDUSTRY NEWS

News briefs of industry activities, products and progress

Andre Debrie, veteran French film equipment inventor, reports the development of a gyroscopic camera which can simulate all camera movements and allow for a complete rehearsal of a scene without moving the camera. According to Debrie, key to the method is a balanced mechanism within the camera, and its chief value is to save time in camera setups.

• • •

J. Burgi Contner, ASC, has been appointed Director of Photography for Robert Lawrence Productions, New York. A veteran of New York location shooting for features and TV films, Contner filmed commercials long before the advent of television. His film career was launched by shooting theatrical commercials and newsreels in Lakeland, Florida.

Contner will photograph and supervise all the camerawork of RLP's productions in New York and Hollywood.

• • •

The use of exposure indexes higher than those published by the American Standards Association have been a recommendation of Eastman Kodak Company since early 1958 to meet the special needs of professional and advanced amateur photographers. Familiar to photographers is Kodak's long standing paragraph in its film instruction sheets which states that the exposure indexes given ". . . include a safety factor intended to prevent underexposure due to variations in equipment and use."

Kodak expects that a change will be made in its published film ratings when forthcoming changes in the ASA rating system resulting in new ASA standards are approved.

• • •

Original papers on photographic techniques and on photographic applications in the medical and biological sciences are published in a very large number of journals. As a result, the Royal Photographic Society of Great Britain points out, it is often difficult to use the existing literature for the solution of both theoretical and practical problems.

The Society has therefore established a bibliography which consists of punch cards, each of which carries an abstract of an original article. Almost four hundred new cards are added annually to the Society's punch-card files, which embrace over two-thousand such classified abstracts. The cards are grouped under 'Kinematography," "Photography," "Administration," and "Microscopy."

With these up-to-date files of compressed data, the Society's librarian is able to quote the references of papers which have a bearing on any problem concerned with cinematography or photography in medicine or biology.

The service is extended without charge to all bonafide inquirers by the School of Anatomy, The University, Cambridge, Great Britain.

• • •

Whenever a distinguished visitor is honored with an official parade and reception in Los Angeles, three motion picture cameras, operating simultaneously, cover the entire tour.

According to Lt. John Brigham, chief of the photographic section of the Los Angeles Police Department, which makes the movies, the thousands of feet of black-and-white 16mm film are for police use. "It gives us a complete record of the event if we need to refer to it," he says.

• • •

A limited exchange of non-exclusive licenses and options to license under patents relating to automatic exposure control systems, including systems used on Bell & Howell and Eastman Kodak electric eye cameras, has been effected in one of two license agreements signed recently between Eastman Kodak Company and Bell & Howell Company.

Under the other agreement, Bell & Howell acquires a non-exclusive license on a double-exposure prevention device patented by Eastman Kodak. ■

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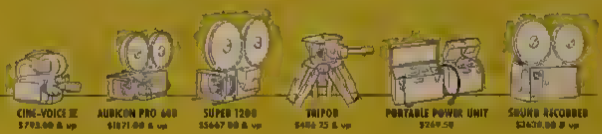
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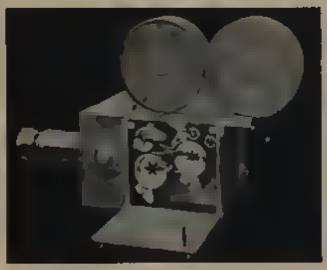
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WHAT'S NEW

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Hi-speed 70mm Camera

Said to be an entirely new concept in 70mm full-frame cameras is the new Photo-Sonics 10B rotary prism camera distributed by Traid Corpn., 17136 Ventura Blvd., Encino, Calif

Camera uses same type prism shutter combination which has proved outstanding in the company's 16mm-1B and 35mm 4B cameras The large frame format plus high fps camera speed offer extra advantages as when filming seat-ejection tests, for example, where photographers are usually not allowed within 2000 feet of the track

Missile launching and tracking, recording the separation of booster motors from missiles and rockets, and high resolution streak photography are just a few of the numerous applications for which this camera is designed The model 70mm-10B operates at speeds up to 360 fps; picture area per frame is 2¼″ x 2¼″.



Title Hot Press

Camera Equipment Co., Inc., New York, announces the Kensol Hot Press for making opaque titles on poster board, paper, celluloid or acetate, photographs, etc It is especially suitable for making movie titles and cards for TV film spots Prints several lines at a time, and will produce 3-D and drop shadow effects in addition to normal lettering.

Stamping head swivels up to 90° for "crawl" work and making special angular effects Thermostat controls preheating of hot plate Prices start at $450.00



Preview Projectar

Paromel Electronics Corp., 3956 W Belmont Ave., Chicago 18, Ill., announces a modified DeVry 35mm projector, Model 2810 PL3, which provides simultaneous projection of 35mm picture work print and sound optical work print. Optical sound section has feed reel mounted at rear of projector while takeup is located in modified lower section. Picture feed and takeup reels remain in normal positions Unit is designed especially for previewing TV film, and will accommodate film for a full half-hour program

200-ft. 16mm Magazine

Flight Research Inc., Richmond 1 Va., announces its new 200-ft capacity 16mm film magazine designed to increase versatility of company's Model 111 and III-B Multidata recording cameras Magazine will take film in 50-, 100- or 200 foot lengths on standard

Continued on Page 590

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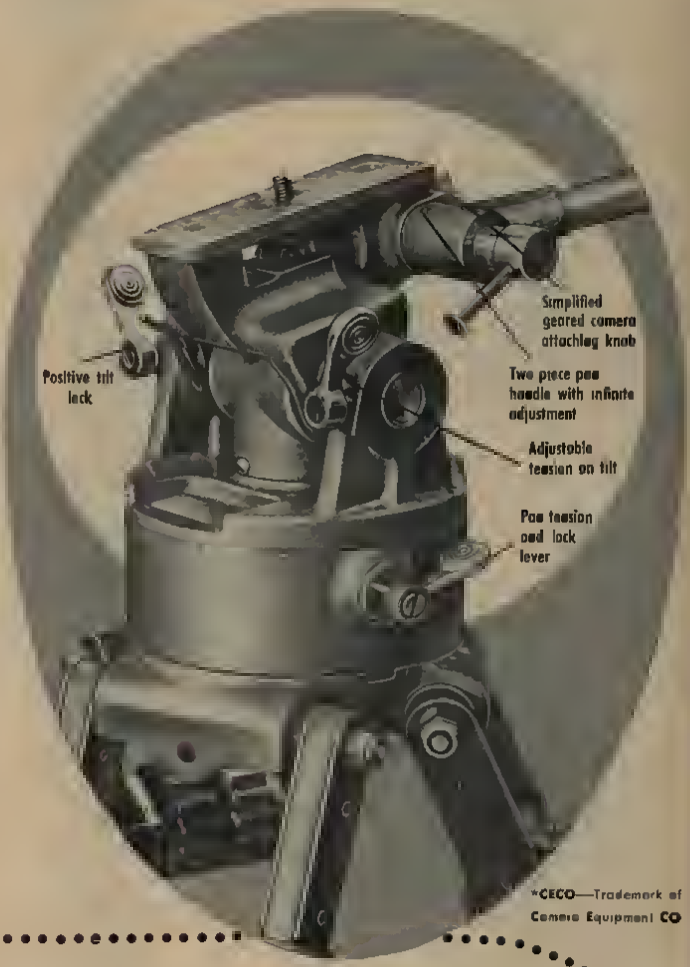
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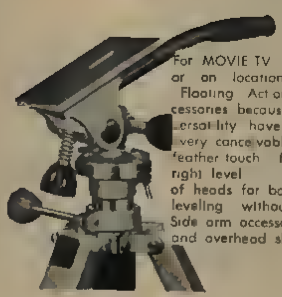
1. Silicone Molecular fluid is in one horizontal chamber. A rotating disc keeps the fluid equally distributed on the internal bearing surface during both panning and tilt operations.
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WHAT'S NEW

Continued from Page 588



spools and uses same film transport as company's 800-ft. M-3 magazine

The new magazine can be used for either pulse or cine operation at speeds up to 40 fps Compactness is achieved through use of stacked reel design of film chamber

Home Movie Synchronizer

Delobel Enterprises, Inc., 435 No. Bedford Dr., Beverly Hills, Calif., is U. S distributors of the French made Synchro-Cine-Phone which may be used with any ¼-inch tape recorder to produce and play back sync sound with any 8mm or 16mm projector. The compact, efficient unit, 1" x 5½" x 3½" in size, lists for $139.50 Brochure is available free.



Remote-controlled Head

Houston-Fearless Corp 11805 W Olympic Blvd., Los Angeles 64, Calif., announces a new power-driven cradle head for use with television cameras in inaccessible or dangerous locations Head is powered by dual motors which tilt camera 30° up or 38° down, or rotate it 370° The remote control panel (inset in photo) can be installed in any convenient location •

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with **Professional CURVED GROOVE**
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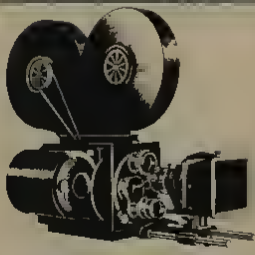
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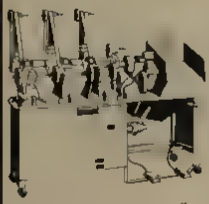
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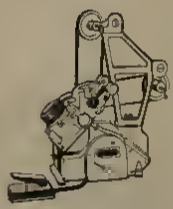
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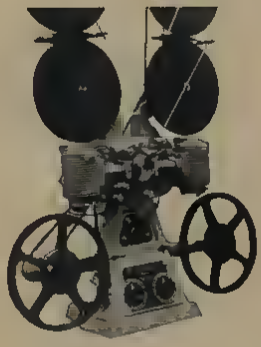
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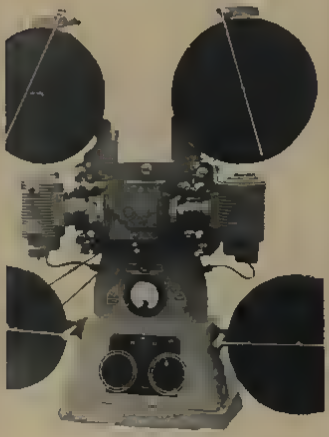
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PHOTOGRAPHIC ASSIGNMENTS

WHAT THE INDUSTRY'S CAMERAMEN WERE SHOOTING LAST MONTH

ASTERISKS INDICATE TELEVISION FILMS

ALLIED ARTISTS

HENRY CRONJAGER 'Raymie and the Barracuda' with David Ladd. Frank McDonald, director.

ARCHIE DALZELL, "The Hypnotic Eye" with Jacques Bergerac and Allison Hayes. George Blair, director.

AMCO STUDIOS

ALAN STENSVOLD, ASC, "Police Station"* "Congressional Investigator"* (Sandy Howard Prods.) Sandy Howard, director.

AMERICAN NATIONAL

MONROE ASKINS, RICHARD RAWLINGS "Lock up"* (Ziv-TV) with MacDonald Carey.

BOB HOFFMAN, CURT FETTERS, RICHARD RAWLINGS, "Bat Masterson"* (Ziv-TV) with Gene Barry.

MONROE ASKINS, BOB HOFFMAN 'This Man Dawson"* (Ziv-TV) with Keith Andes.

LLOYD KNECHTEL, ASC, Commercials*

WILLIAM WHITLEY, ASC, "Space"* (Ziv-TV) with Bill Lundigan.

MONROE ASKINS, CURT FETTERS, "Challenge"* (Ziv-TV) with George Nader.

CALIFORNIA STUDIOS

NICK MUSURACA, ASC, "The Lineup"* with Warner Anderson and Tom Tully.

STUART THOMPSON, ASC, "Have Gun, Will Travel"* with Richard Boone and Kam Tong.

FLEET SOUTHCOTT, "Gunsmoke'* with James Arness and Dennis Weaver.

CASCADE PICTURES

ELWOOD BREDELL, ASC, Commercials*

WILLIAM SKALL, ASC, Commercials*

COLUMBIA

CHARLES LANG, JR., ASC, "The Franz Liszt Story" (C'Scope & Color. Goetz Picts.) with Dick Bogarde and Capucine. George Cukor, director.

CHARLES WELBORN, "Alcoa Goodyear Theatre"* (Screen Gems), "Manhunt"* (Screen Gems) with Victor Jory and Patrick McVey. Fred Jackman, director.

IRVING LIPPMAN, "Tightrope"* (Screen Gems) with Michael Connors.

GERT ANDERSEN, ASC, "Danna Reed Show"* (Screen Gems) with Donna Reed. Oscar Rudolph, director.

OSWALD MORRIS, "Our Man in Havana" (Kingmead Prods.; C'Scope; shooting in Havana) with Alec Guinness and Maureen O'Hara. Carol Reed, director.

FRED GATELY, ASC, "Father Knows Best"* (Screen Gems) with Robert Young and Jane Wyatt. Peter Tewksbury, director.

JACK HILDYARD, "Suddenly, Last Summer" (Sam Spiegel Prods.; shooting in London) with Elizabeth Taylor and Montgomery Clift. Joseph Mankiewicz, director.

HENRY FREULICH, ASC, "Dennis the Menace"* (Screen Gems) with Gloria Henry & Herbert Anderson.

BURNETT GUFFEY, ASC, "Mountain Road" (WideScreen) with James Stewart. Daniel Mann, director.

WILKIE COOPER, "Gulliver's Travels" (Ul Morningside World Wide, S.A., shooting in Spain) with Kerwin Matthews and Jo Morrow. Jack Sher, director.

CHARLES LAWTON, JR., ASC, "The Gene Krupa Story" (Philip A. Waxman Picts.) with Sal Mineo and Susan Kohner. Don Weis, director.

HARRY STRADLING, ASC, "Who Was That Lady?" (Ansark-Sidney Prods.) with Tony Curtis and Dean Martin. George Sidney, director.

WILFRED CLINE, ASC, 'Because They're Young" (Drexel Films) with Dick Clark and Michael Calan. Paul Wendkos, director.

PHILIP TANNURA, ASC, "Man from Blackhawk"* (Alcoa Theatre, Screen Gems) with Robert Rockwell.

DESILU STUDIOS—Culver City

LUCIEN ANDRIOT, ASC, 'U.S. Marshall"* (Desilu Prods.) with John Bromfield.

PAUL IVANO "Man with a Camera"* (Desilu Prods.) with Charles Bronson.

CHARLES VAN ENGER, ASC, "Betty Hutton Show"* (Desilu Prods.) with Betty Hutton. Richard Kinon, director.

DESILU STUDIOS—Gower

KENNETH PEACH, ASC, "Lassie"* (Jack Wrather Prods.) with Juna Lockhart and John Provost.

ROBERT PLANCK, ASC "The Millionaire"* James Sheldon, director.

ROBERT HAUSER, Wyatt Earp"* (Desilu Prods.) with Hugh O'Brien.

PAUL IVANO "The Texan"* (Desilu Prods.) with Rory Calhoun.

CHARLES STRAUMER 'The Untouchables" (Desilu Prods.) with Robert Stack and Jerry Paris.

ROBERT PITTACK, ASC, "Ann Sothern Show"* (Desilu Prods.) with Ann Sothern.

DESILU STUDIOS—Hollywood

ROBERT DE GRASSE, ASC, "Danny Thomas Show"* (Desilu Prods.) with Danny Thomas, Sheldon Leonard, director. "Love and Marriage'* (Desilu Prods.) George Abbott, director.

DISNEY STUDIOS

RUSSELL HARLAN, ASC, 'Pollyanna" (Shooting in Napa Valley) with Jane Wyman and Richard Egan. David Swift, director.

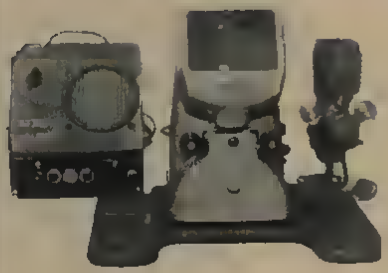
LUCIEN BALLARD, ASC, "Elfego Baca"* with Robert Loggins and Robert Simon. William Beaudine, director.

GORDON AVIL, ASC, "Swamp Fox'* with Leslie Nielsen and Barbara Eiler.

Continued on Page 598

OUR EXPERIENCE IS YOUR KEY TO

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CAMART DUAL SOUND EDITOR Model SB-111

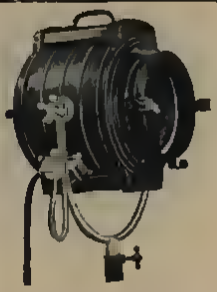
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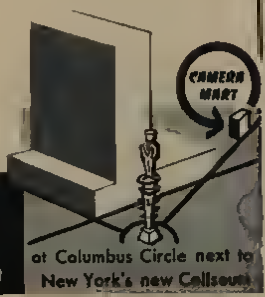
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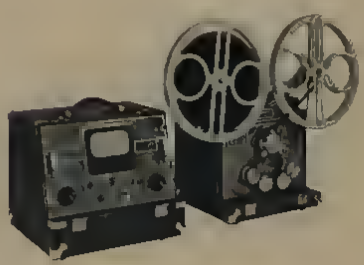
kenya

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Photo at left shows the shooting of a scene for an African advertising film. Renato Spinotti is on camera, and Roger Norton operates the Magnasync Type 1 recorder.

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Dept. of Information	Kampala, Uganda
Sudan Film Unit, Ministry of Information & Labor	Khartoum, Sudan
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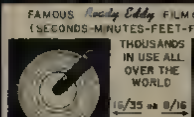
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PHOTOGRAPHIC ASSIGNMENTS

Continued from Page 594

HARRY WAXMAN "The Swiss Family Robinson" (Panavision & Tech, Buena Vista release shooting in B W I) with John Mills and Dorothy McGuire Ken Annakin, director

FOX WESTERN AVENUE

JAMES VAN TREES, ASC, "The Many Loves of Dobie Gillis"* with Dwayne Hickman Rod Amateau director

LLOYD AHERN, ASC, "How to Marry a Millionaire"* with Barbara Eden, Merry Anders and Lisa Gaye Danny Dare, director.

GENERAL SERVICE

HAROLD LIPSTEIN, ASC, "Adventures of Ozzie & Harriet" (Stage 5 Prods.) with Ozzie, Harriet, David and Rickey Nelson Ozzie Nelson, director

FRANK REHMAN ASC, "Perry Mason"* (CBS-TV) with Raymond Burr and Barbara Hale

MEREDITH NICHOLSON, "Border Patrol"* (Gallu Prods.) with Richard Webb, John Peyser director

GOLD MEDAL STUDIOS—N Y

J BURGI CONTNER ASC, "Pretty Boy Floyd" (Le Sar Prod.) with John Ericson Herbert Leder, director

GOLDWYN STUDIOS

NORBERT BRODINE, ASC, EUGENE POLITO, "Loretta Young Show"* (Lewislor Prods.) with Loretta Young

INDEPENDENT

BORIS KAUFMAN, ASC, 'The Fugitive Kind" (Jurow-Shepherd Prod. for UA, shooting in N Y) with Marlon Brando and Anna Magnani Sidney Lumet, director.

JAMES SEELEY, ASC, Missile Test Project RCA Atlantic Missile Range, Cape Canaveral, Fla

MORRIS HARTZBAND, "Brenner"* (Kenco, shooting in N Y.) with Ed Binns and James Broderick Gerald Mayer and Herman Hoffman, directors

LEONARD CLAIRMONT, "Kirby's Gander" (Tiger Prods color, shooting in Canada) with James Brown and Frances Rafferty Edw Dew, director.

JOHN ALTON "Elmer Gantry" (Eastman color, Elmer Gantry Prod for UA release) with Burt Lancaster and Jean Simmons. Richard Brooks, director

WILLIAM CLOTHIER, "Alamo" (Todd AO Batjac Prod for UA, shooting in Texas) with John Wayne and Richard Widmark John Wayne, director

STANLEY CORTEZ, ASC, "Invasion of Mars" (Cinemagic & Eastman color, Sino Prod.) with Gerald Mohr and Nora Hayden Ib Melchior, director

JOSEPH BRUN ASC, "The Southern 500" (Darlington Films for Howco Int., shooting in S C.) with Rory Calhoun and Alan Hale, Jr Paul Helmick, director

CLARK RAMSEY, ASC, "The Choppers" (Rushmore Prods.) with Tom Brown and Marianne Gaba Lee Jason, director

RAY STURGESS "A Terrible Beauty" (Cine-World Prods. for UA release, shooting in Ireland) with Robert Mitchum and Dan O'Herlihy Tay Garnett, director

ERNEST LASZLO, ASC, "Tormented" (Chevrolet Prods.) with Richard Carlson and Susan Gordon Bert I Gordon, director

RTTV STUDIOS

JACK MARTA, "Rescue 8"* (Cinefilm Inc.) with Jim Davis and Lang Jeffries Robert Walker, director

METRO-GOLDWYN-MAYER

JOSEPH RUTTENBERG, ASC, "The Subterraneans" (C'Scope & Color) with Leslie Caron and George Peppard Randal MacDougall, director

ROBERT BRONNER, ASC "Please Don't Eat the Daisies" (C'Scope & Color) with Doris Day and David Niven. Charles Walters director

PHILIP LATHROP, "Peter Gunn"* (Spartan Prods.) with Craig Stevens and Lola Albright. "Mr Lucky"* (CBS-TV)

HARKNESS SMITH, "Philip Marlow"* (Jack Chertok Prods.) with Phil Carey.

RAY FOSTER, ASC, Commercials*

PAUL VOGEL, ASC, "The Gazebo" with Glenn Ford and Debbie Reynolds. George Marshall, director

WILLIAM MARGULIES, "Not for Hire"* (Calif. National Prods.) with Ralph Meeker.

DALE DEVERMAN "One Step Beyond"* with John Newland

WILLIAM SPENCER, "Fibber McGee and Molly"* (NBC TV) with Bob Sweeney and Cathy Lewis

N.B.C.

ALAN STENSVOLD, ASC, "You Bet Your Life"* with Groucho Marx Bob Dwan and Bernie Smith, directors

PARAMOUNT

LESTER SHORR, ASC, "Bonanza"* (NBC-TV) with Michael Landon and Dan Blocker.

ROBERT SURTEES, ASC, 'Boy of Naples" (Scribe Prod VistaVision & Technicolor, shooting in Rome) with Clark Gable and Sophia Loren Mel Shavelson, director

ALDO TONTI, "Savage Innocents' (Magic Films, shooting in Canada) with Anthony Quinn and Yoko Tani. Nicholas Ray, director

REPUBLIC STUDIOS

GEORGE DISKANT, ASC, ELLIS CARTER, ASC WALTER STRENGE, ASC, "Robert Taylor Detective"* (Four Star Prods.) with Robert Taylor

GUY ROE, ASC, "Dick Powell's Zane Grey Theatre" (Four Star Prods.) with Dick Powell

CARL GUTHRIE, ASC, "Richard Diamond, Private Detective"* (Four Star Prods.) with David Janssen

GLENN MACWILLIAMS, ASC, 'The Plainsman"* (Four Star Prods.) with Michael Ansara.

GEORGE DISKANT, ASC, "June Allyson Show"* (Four Star Prods.) with June Allyson

GUY ROE, ASC, "Black Saddle"* (Four Star Prods.) with Peter Breck and Russell Johnson.

CHARLES BURKE, "Wichita Town"* (Four Star Prods.) with Joel McCrea, "Johnny Ringo"* (Four Star Prods.) with Don Durant and Karen Sharpe.

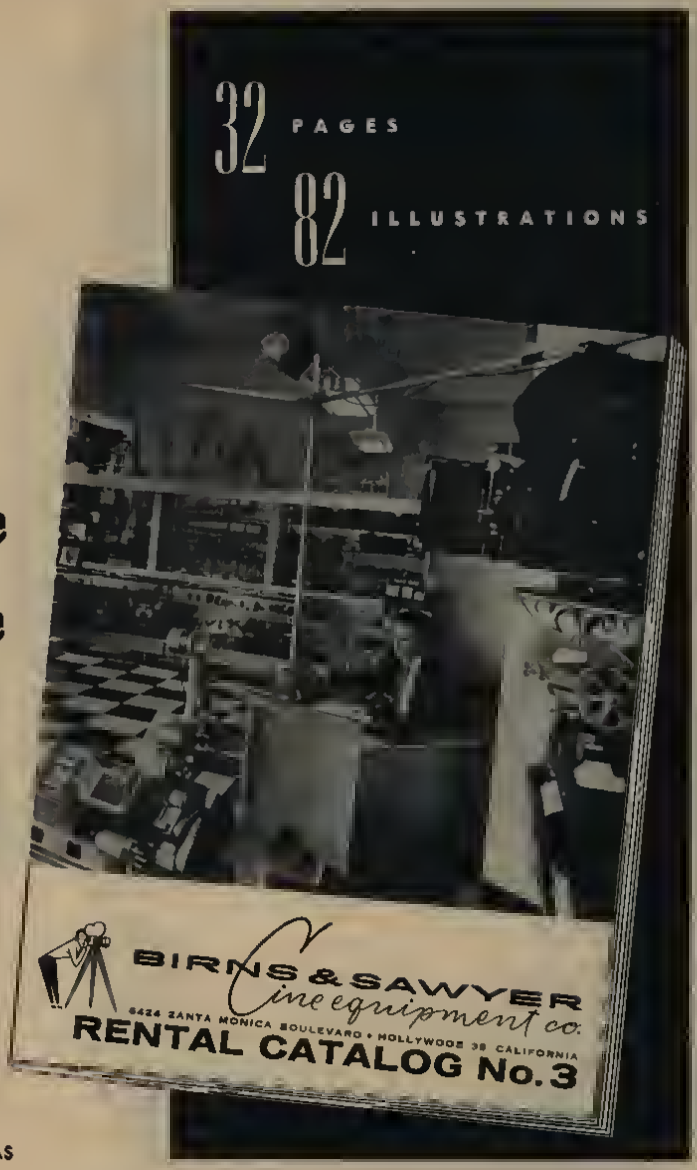
HOWARD SCHWARTZ, "The Rifleman"* (Four Star Prods.) with Chuck Connors and Johnny Crawford

EMMETT BERGHOLZ, "Troubleshooters"* (Filmaster Prods.) with Keenan Wynn and Bob Mathias, Robert Altman, director, 'Death Valley Days"* (Filmaster Prods.)

Continued on Page 636

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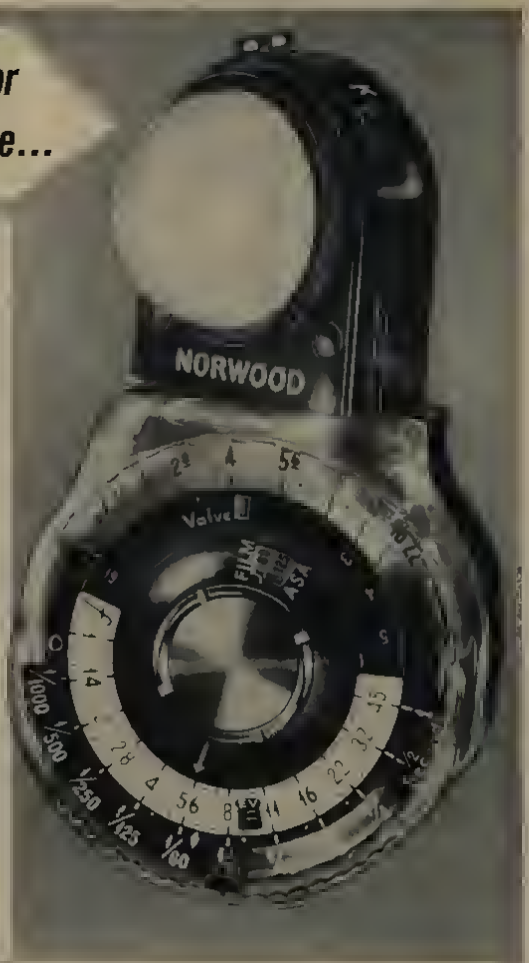


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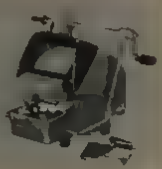
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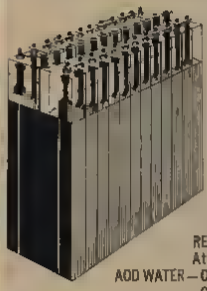
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TECHNICAL QUESTIONS & ANSWERS



Conducted by Walter Strenge, A.S.C.

QUESTIONS relating to cinematography or other phases of film production are invited from readers and will be answered by letter by Walter Strenge or by other qualified members of the American Society of Cinematographers. Questions and answers considered of general interest will appear in this column —*Ed*

Q In the realm of animation, what is meant by "field"?—*W. H.P., Austin, Texas.*

Answer: "Field," in animation terminology, is a term used to define the boundaries of an area to be animated or photographed.

Although the dimensions of a "field" may be arbitrary, the industry generally uses the Acme system, which defines a field unit as the equivalent of 1-inch in width. Any field number, then, becomes a multiple of one—i.e., a 12 field would be 12 inches wide, an 8 field, 8 inches wide, etc.

It is customary, in animation work to have the camera equipment used calibrated with reference to fields so that the desired areas may be photographed precisely without need for time-consuming line-up work. — *Ub Iwerks A.S.C., Walt Disney Studio*

Q 16mm Ektachrome film, which I exposed outdoors in below-freezing temperatures was mostly under-exposed. Would the underexposure be due to the effect of low temperatures on the film, rather than a wrong meter reading? If low temperature was the cause, is there a formula to be followed in making allowance for this when computing exposure?—*S.B., New York, N.Y.*

Answer: Data available on a single test made of the effect of low-temperature on emulsion speed, revealed a speed loss of approximately ⅓ lens stop at 0° F temperature and about ½ stop at minus 30° F. The data resulting from this test should be used only as a guide for a specific test whenever low temperature exposure conditions are anticipated.

Since the slight loss of speed resulting from low temperature is of a smaller order of magnitude than the exposure latitude safety margin for this film, one would hardly suspect low temperature as the only variable contributing to the severe underexposure results mentioned above.

It would be advisable to have your exposure meter calibrated and to give careful consideration to the method of use of the meter to insure that the scenes photographed were measured correctly for scene brightness. — *Vaughn Shaner, A.S.C. Associate.*

Q How can correct exposure be determined when photographing rear projection on a ground glass, also when photographing aerial image animation? —*L.A.B., New York, N.Y.*

Answer: To my knowledge there is no set formula whereby correct exposure or balance can be determined in these instances. Rather it is a visual concept that is gained through experience. However, the density of the print which is to be projected on the background screen is of vital importance in the results of the finished scene. This applies to black-and-white as well as color.—*Paul Eagler, A.S.C.*

Q How can I produce the effect of smoking, boiling liquids for a laboratory scene, without using dry ice?— *W. E. Lobb.*

Answer: Use liquid smoke (Titanium Tetrachloride) But do not under-estimate dry ice. It is excellent for such effects.—*Ray Mercer, A.S.C.* ■


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THE PHOTOGRAPHY OF "BEN HUR"

MGM's multi-million dollar production was photographed entirely in Italy on 65mm Eastman Color film with Panavision cameras and lenses by three camera crews supervised by Robert Surtees, A.S.C.

By LIBERO GRANDI



ON LARGE EXTERIOR Circus set in Rome, cameramen Robert Surtees, ASC, on boom, right of camera, points out a new angle of view to Director William Wyler, foreground

ACCORDING TO Robert Surtees, A.S.C., who directed the photography of Metro-Goldwyn Mayer's "Ben Hur" in Italy, over one million feet of Eastman Color 65mm negative was exposed there for the production. A total of six Panavision 65mm cameras were shipped to Rome by the studio, and often all of them were shooting at the same time on large spectacle scenes such as the chariot race.

The monumental undertaking of photographing "Ben Hur" in Italy had been carefully planned in advance during cooperative pre-production meetings attended by Surtees, Director William Wyler, the screen writer, art director and costumer.

Shooting with the wider 65mm negative, Surtees explained, involved virtually a trebling of efforts as against shooting in 35mm. In composing scenes for the wider picture format, great care had to be taken with the lighting because the extreme sharp rendition obtained with Panavision lenses brings to the screen with exceptional clarity every detail in fabrics, costumes, and props as well as any irregularities in facial features or application of makeup. Successful photographic results were assured through the cooperative efforts of MGM's costume and makeup departments which planned their phases of operation to

accommodate the photography in every possible way.

The Panavision wide-angle lenses used were 57mm. These were employed mostly for two-shots and closeups. On some two-shots, as where one person stood slightly ahead of or behind the other, it was difficult to keep both subjects in sharp focus with this lens. Here the problem was solved by focusing sharply on the most important of the two persons and adjusting the lighting on the other—taking care that the colors in the latter's costume was complimentary to that of the important subject's dress. The effect on the screen is a sort of equalization of focus on both subjects. Except in those cases where extreme split focus was desired, Surtees invariably used small f/ stops and intensified lighting.

As MGM plans to release "Ben Hur" in both 65mm and 35mm, it was necessary, Surtees said, to consider this at all times when composing scenes in the camera finder. Whenever compositional requirements for the 35mm picture format conflicted with those for the more important 65mm, however, the scene was invariably composed for the latter.

An ever present problem during the filming of "Ben Hur" was maintaining a vigilant check on the color temperature of the light. And because shooting in Rome extended from May until December, it was necessary to aim for consistency in color temperature, so scenes shot in May would look no different than those shot in December, when days were shorter and the sun closer to the horizon.

Surtees found the color temperature of sunlight quite variable. In Rome, especially, the luminosity is intensive, yet is often characterized by sharp changes that take place within only a few hours. Extensive tests of light conditions were made, after which the necessary corrective filters were ordered for use on all of the Panavision cameras. It was Surtees' aim to produce negatives so precisely color-balanced that the film laboratory's task in correcting for color would be reduced to a minimum and result in prints approximating his expectations.

When making color temperature tests, Surtees used the Spectra color temperature meter. With this instrument he

Continued on page 622



BIRD'S-EYE VIEW of camera crew on elevated boom shooting chariot race scene for "Ben-Hur" in Rome, Italy.



BOOM MOUNTED Panavision-65 camera is trained on actors Charlton Heston and Jack Hawkins shooting scene on Galley deck.



CLOSEUP OF racing charioteers was shot with the Panavision-65 camera mounted on fast camera car moving ahead of chariot.



LIGHTWEIGHT, portable generator powered by small pulse jet engine produces realistic fog, mist or smoke effects of substantial duration by vaporizing liquid compound fed from reservoir carried on shoulder strap by operator

FOG MAKER

Compact, portable machine creates fog, mist and haze effects for motion pictures on the sound stage or on location.

FOR MOTION PICTURE scenes, there is but one way to produce realistically the effect of fog in a scene artificially. In recent years, the various major studios have developed a number of methods of doing this, but in each case the equipment used was of their own making. There has been nothing on the market in the way of a portable, easy-to-use commercial-type fog maker, until Mole-Richardson Company of Hollywood recently introduced its line of Dyna Fog-makers. Now realistic fog effects can be made easily and inexpensively for any type film production, be it a Hollywood feature, TV film, or an industrial or business film production. Cost of the M-R fogmakers is so nominal that any film maker anywhere can own one.

The photo above shows one type of fog that can be created by this equipment and demonstrates the simplicity of the operation. Fog effects may be created indoors or out and the fog can be made to hug the floor or ground or remain suspended in the air. To aid in clearing the air after a fog scene is shot indoors on the sound stage, Mole-Richardson also supplies a compound which can be put through the fog maker which accelerates the dispersal of the fog it produced moments earlier.

The fog maker pictured is Mole-Richardson's Type 1983. It is capable of producing vapors in considerable quantity to simulate the effect of fog, smoke, haze and mist. The dispensing unit weighs about 17 pounds, and the 4½-gallon tank of fog-making liquid, which the operator carries on his back, weighs 10 pounds when filled.

The fog generating unit is powered by a small jet-pulse engine that uses gasoline for fuel. The unit's fuel tank capacity is sufficient for about 1½ hours of continuous operation. To create fog or any similar effect, a supply valve is opened that allows the fog-producing compound, which the M-R company calls "fog juice," to flow to the generator. The pulse-jet engine is started and a monitoring valve convenient to the operator is adjusted by vernier control to regulate the flow of "fog juice" through the generator. In this way fog or mist of varying densities may be produced to suit the requirements of a scene.

With the company's Type 1963 fog maker, there is provision for attaching a fog cooling unit which, when filled with dry ice, cools the fog vapor so it will hug the floor or ground of the set to produce the effect of low-lying fog or mists.

The fog maker units can also be utilized to produce the effect of dense smoke, without introducing the discomfort of real smoke on the set or location. On a recent location test of this equipment, it was successfully used to create the illusion of smoke from a forest fire.

There is a versatile feature of the M-R fog makers which many Hollywood studios have found beneficial when shooting on location away from the studio. The fog makers may also be used for spraying disinfectant, pest control insecticides, or scents for combating unpleasant odors. Thus the machine that was used to produce fog earlier in the day for one scene, may be put to use spraying a location site to free it of mosquitos, moths and grasshoppers—three pests which invariably plague location production crews and casts.

The Mole-Richardson line of fog makers includes two other models, in addition to the Type 1983 described

Continued on Page 632



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"Move in for the dolly shot."

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"That's good—let's make it again."

"Strike the set."

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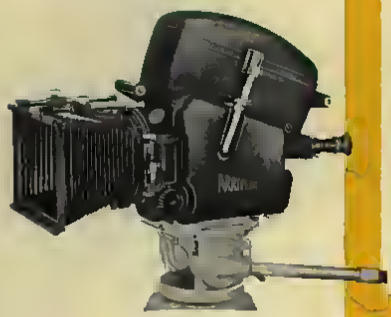
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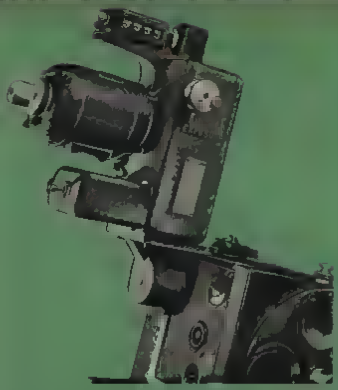
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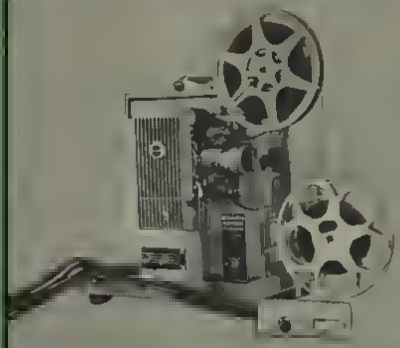
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IN AN ARTICLE in the July, 1941, issue of American Cinematographer, and also in the August, 1922, issues of the Journal of the SMPE, Charles G Clarke, A.S.C., described a new and interesting method for introducing clouds into exterior scenes filmed in black-and-white. Not only did the idea evoke wide interest at the time among cinematographers everywhere, but its legend has been passed along to succeeding generations of embryo cameramen from among whom the editors regularly receive inquiries about Clarke's "cloud-making" system.

For the benefit of interested cinematographers, the development and use of the system is recounted in the article beginning on this page.—Ed.



BY UTILIZING a photographic transparency of a cloud formation it is possible to superimpose clouds in a scene like this for improved pictorial appeal

CLOUDS MADE TO ORDER

How clouds are superimposed on exterior scenes at the time they are filmed by shooting through photographic transparencies.

By CHARLES G. CLARKE, A.S.C.

BECAUSE CLOUDS have always been considered an important pictorial element when photographing exteriors for motion pictures, it is possible, thanks to an invention of some 20 years ago, to add clouds to almost any exterior scene by synthetic means at the time of photographing it.

A landscape with a cloud-filled sky is far more attractive than the same scene without clouds. It used to be that a motion picture company was obliged to wait sometimes for long periods on location for a desirable cloud formation to appear. Other studios have shot exteriors as they found them, then duped "clouds" in later at the studio. Because budgets for many productions often do not permit either of these alternatives, there was need for a simple process that would produce clouds in a scene synthetically.

We developed such a process at 20th Century-Fox studio many years ago, and it is still in use today. It employs appropriate large-scale photographic transparencies of real cloud formations, which are set before the camera so the clouds are photographed simultaneously with the rest of the scene—operating on the principle that the barren sky operates as a printing light in conjunction with the transparency.

The transparency reduces the light passing to the film in proportion to the density gradations of the transparency. On the finished positive the whitest "cloud" is of the brightness of the unfiltered sky. As photographic emulsions are especially sensitive to blue light, plain sky areas are rendered very

Continued on Page 632



THE PHOTOGRAPHIC transparency is set up before the camera lens, and the scene and clouds photographed simultaneously. Curved transparencies are used where camera is to be panned.



FIG A—Example of extreme depth of field created by use of traveling matte process

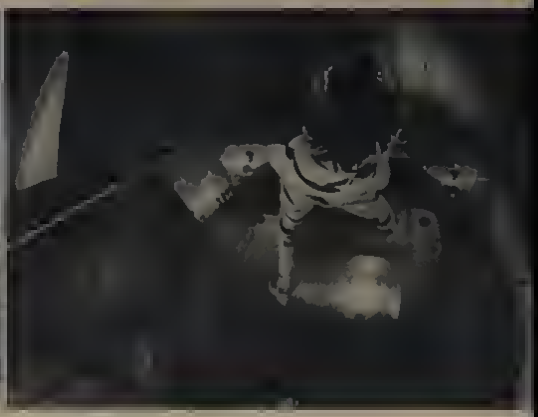


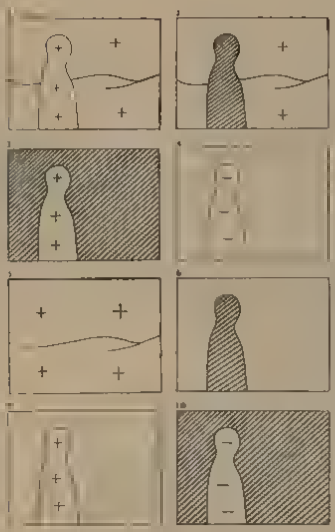
FIG B—Process can also create scenes having the illusion of great danger as in this scene from a British production.

A BLACK-&-WHITE TRAVELING MATTE PROCESS

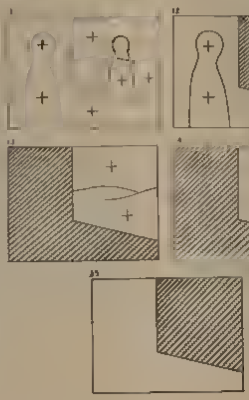
The system currently in use in Pinewood Studios, London, by which foreground action filmed seporately is combined with a background scene which has been or will be photographed elsewhere.

By ROBERT L. HOULT, FRPS, FBKS

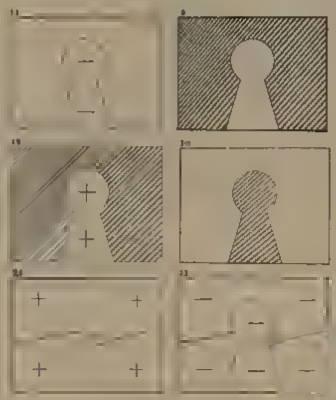
Formerly Technical Adviser, Pinewood Studios, England



FIGS 1 to 6, inc., and 9 and 10



FIGS 11 to 15, inc



FIGS 17 to 22, inc.

COMPOSITE PHOTOGRAPHY has been practiced in one form or another for almost as long as photographic processes have been available. In a simple example, a composite image is made up from two separate component images. One image is called the "background"; considered separately, it



FIG C—With traveling matte process, a person may be made to play a "twin" role with the actors shown passing before one another

occupies the full picture area. The other image is called the "foreground", and occupies part only of the picture area. The composite shows the full foreground image and only those portions of the background image which are not covered by the foreground image.

To achieve this effect, use is made of a printing device known as a "matte", or, in cinematographic parlance as a "traveling matte". A traveling matte is a series of images of the silhouette of an object, presented in two tones only, usually black and white. The silhouette image or matte is used during printing to mask that portion of the background image which it is intended to replace by the foreground image. Animation is preserved by the use of a series of such mattes on a strip of film, each individual matte image corresponding to one image on the foreground film.

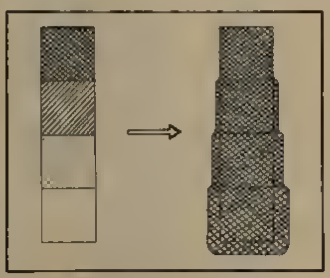


FIG 23—Size of original test wedge and of the resulting print (exaggerated)

A composite image formed from one background and one foreground may then be treated as a new background, to which a further foreground may be added. This progression may be maintained indefinitely (within practical limits) so that many separate foregrounds may ultimately be added to an original background, each foreground requiring its individual traveling matte. The successful production and use of traveling mattes is the subject of a specialized technique.

The earliest references to traveling matte processes which are known to the author, are patent applications in the U.S.A. by F. D. Williams in 1918 for a monochrome process and by J. A. Ball in 1927 for a Technicolor process. Much work has been done since these dates in many countries; among more recent publications are those of T. W. Howard[1] in 1942, and G. J. P. Levenson and N. Wells[2] in 1951.

Fig. 1 portrays as a photographic positive a man standing in front of a landscape. Suppose the lighting on the man be made independent of the lighting on the landscape. If we extinguish the lighting on the man, we are left with Fig. 2. Alternatively, if we extinguish the lighting on the landscape, we are left with Fig. 3. Photographic superimposition of Figs. 2 and 3 produces Fig. 1.

To obtain Fig. 3, we require a negative as in Fig. 4. This may be obtained by photographing the illuminated man in front of an unilluminated backing.

Fig. 2 is the sum of Figs. 5 and 6. Fig. 5 is a normal positive. Fig. 6 is a silhouette in two tones of the man, otherwise known as a matte.

To obtain Fig. 6, the following expedients have at times been used.

(1) *Intensification of Fig. 4.* This is ineffective in those areas of Fig. 4 where no density exists, such as deep shadows. Further, the intensified image will in general contain tones of different densities. Now the size of a photographic image is a function of its density, as is seen when a dense print is made of a step-wedge as in Fig. 23. The resulting image is no longer congruent with the original wedge; in the same way, a matte made in this manner can never exactly fit the corresponding foreground image.

(2) *Superimposition of Figs. 4 and 9.*—This gives an image of relatively uniform tone, containing however residual density variations due to the product of negative and positive emulsion characteristics, neither of which is linear. Similar density variations can also occur if Figs. 4 and 9 are from different color aspect records, such as color separation negatives. If

Continued on Page 634

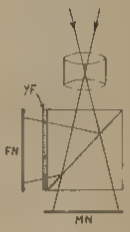


FIG 24—Diagram of beam-splitting system of JARO camera, below.



FIG 25—The JARO beam-splitting camera is typical of those used in the production of traveling mattes



DURING THE transmission of a TV film, the video operator is guided by the wave form monitor that is located beneath the picture monitor in the television control room, and which analyzes the picture in terms of electrical transmission characteristics.

IMPORTANCE OF 'REFERENCE WHITE' IN FILMS FOR TV

The importance of maintaining proper film density relationships that are compatible with the transmission characteristics of the television system.

(THE FOREGOING is based on a talk given recently by John Stott, Assistant Manager of TV Programming, Eastman Kodak Company, before a joint gathering of members of the National Television Film Council and the New York Section of the Society of Motion Picture and Television Engineers —Ed.)

MOST OF THE FILM shot for television is top notch—when viewed in the screening room. But the major concern of producers of filmed TV spots, and especially of the cameramen who photograph such films, is to make sure this footage comes across on the home receiver the way the film producer expects it to.

This, film technical men believe, can be accomplished by taking some of the guesswork out of the video engineer's hands. For example, when a 60 second TV spot announcement flashes on the video engineer's monitor, how can he determine in a split-second whether the sponsor is selling refrigerators or the attractive black sweater the model is wearing? Truth of the matter is, he can't. If he adjusts his controls for the refrigerator and the sponsor is selling sweaters, all definition in the featured product will be lost. The engineer must make an educated guess on the spot. How much better would he the transmission result if the engineer were provided with a reference to guide him in setting contrast, thus insuring that the image of the sponsor's product appeared on home receivers properly modulated.

Such a reference or "guidepost" can be "reference white," which, combined with lighting ratios easily handled by the TV system (not to exceed 20-to-1), can practically guarantee that a sponsor's visual message will not be garbled.

Thus, there *is* a practical and effective means of communication between the maker of the filmed TV spot and the video engineer at the controls in the television station. There *are* recommendations that a film producer and his cinematographer must strive to attain if the TV films they make are to appear on home receivers as they were *planned*.

In a recent workshop session held in New York City and attended by men whose interests ranged from planning and selling TV ad spots to the production of such spots on film, it was demonstrated how important it is to place certain objects in a scene so that a means of communication exists between the producer of the film and the video operator. Furthermore, the demonstrations showed the importance of maintaining proper film density relationships that are compatible with the transmission characteristics of the television system.

When these aims are accomplished, the responsibility for the quality of the film picture appearing on the home receiver is largely in the hands of the film producer, so that what he wants to show or illustrate—the visual effect he wishes to create—is in his hands and not subject to further interpretation.

As an example, the producer may be striving to emphasize or accent some object in his film—such as the product in a commercial. Unless certain precautions are taken at the time the film is being photographed, the video operator may misinterpret the sponsor's aims and set video levels so that the product image reproduces badly on the home receiver while the pretty girl demonstrator looks great. This may please the Screen Actors' Guild, but it generally reduces advertising people to apoplectic fits. Actually the video operator is limited by FCC rules and regulations to

Continued on Page 630

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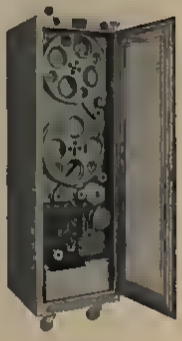
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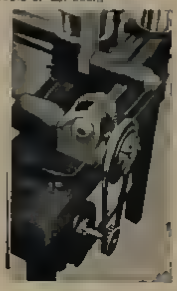
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COLOR IN MOTION PICTURES AND TV

Part II: Natural color on film

By ROBERT ALLEN MITCHELL

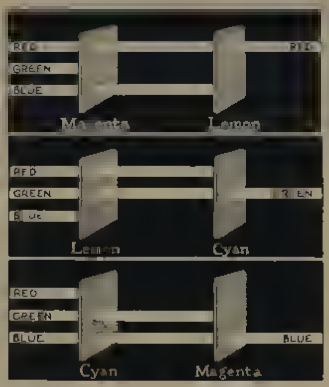


FIG 1—The action of subtractive color film dyes. Color of each dye is complementary to one of primary colors (red, green, blue), but this is incidental. Purpose of each dye (cyan, magenta, lemon) is to regulate amount of one of the primary colors passing through film without affecting transmission of remaining two

THE TERM "natural color" is applied in a purely technical sense to all processes which are capable of producing reasonably faithful reproduction of scenes in full color. Such processes involve the recording of three primary spectral regions (the spectrum divided roughly into its red, green and blue-violet bands) and the subsequent reproduction of the lightness-darkness values of the "primary color records" in terms of the primary hues which are recombined to form a full color image.

Now, the use of a natural-color process or film by no means requires a slavish recording of the exact color values in each and every sense. Because cinematography is an art, the cinematographer is often as free as the painter to employ color as a dramatic instrument. The spectrum is the cinematographer's palette; and the full range of color it is capable of providing comprises every conceivable atmospheric effect and mood in the vast spectrum of human emotions.

Specifically, an interior shot which places special emphasis upon the amber tones of the scene better suggests the warmth of firelight and a mood of intimacy than a cooler, more "natural" color rendering. A night scene is often more effective when an overall bluish tone prevails—a common example. A bright yellowish accent suggests sunny cheer or withering desert heat, depending upon the context, while a predominant hint of lavender connotes an air of mystery or ominous gloom.

These are but a few suggestions necessarily selected at random, inasmuch as the psychological effects of "color toning" are so multifarious that even a large volume could scarcely exhaust them! The many superb color productions presently playing in motion-picture theatres attest to the happy fact that cinematographers are well acquainted with the dramatic potentialities of visually distorted, but emotionally true, color rendition.

Even though a "literal" color rendition from the beginning to the end of a picture is not always desirable, it should be kept in mind that the flesh tones of the players should nearly always be photographed in their natural colors. This requirement is sometimes met in the face of other color demands by colored backlighting or by shooting through tinted gelatins having cut-out centers to provide color vignetting. There is some leeway even in the rendition of flesh tints, but deliberate departures should normally be on the warm (red) side of the color scale. An exhaustive examination of Technicolor release-print samples reveals that the film-going public definitely prefers rather ruddy skin tones.

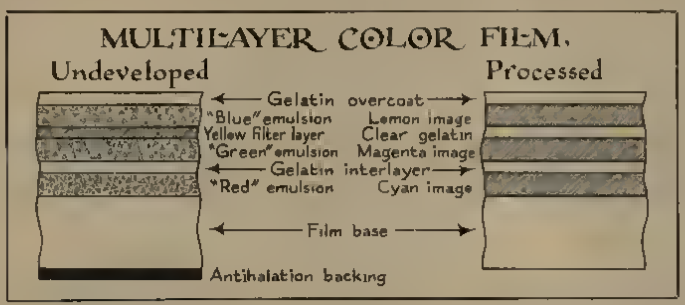


FIG 2—Multilayer color film in cross-section to show its structure. Each of the three thin emulsions is sensitized to one primary color (approximately one third of the spectrum) and is developed to a dye image of the complementary color. The yellow filter layer, which is removed in processing, prevents blue light from affecting the green and red recording emulsions

The additive method of color reproduction (outlined in Part I of this article) is undeniably more "elegant" from the technical point of view than the subtractive method used in motion pictures. Additive film projection has been tried (and for TV purposes strongly advocated), but even though it is capable of maximum color range and fidelity, the optical complexities of 3-image registration on the screen and the image-brightness deficiencies occasioned by the low transmittance of narrow-band red, green, and blue filters pose serious problems of a practical nature.

Unlike the additive method, the subtractive process provides colored images *on the film*. The red, green, and blue "records" are combined as three superposed dye images in the print, the color of each image being *comple*

mentary to the primary color it represents. The image obtained from the red band of the spectrum is accordingly printed as a cyan (green-blue) positive image because cyan dye controls the amount of red light passing through the film while allowing the green and blue components of the white projection light to pass through unimpeded (in theory, at least). Likewise, the green and blue records are printed as magenta (purplish rose) and lemon (greenish yellow) positive images, respectively.

The simplicity of the subtractive color principle is best appreciated by referring to Fig. 1 and regarding the white light of the projector arc lamp as an "equalized" mixture of red, green, and blue(-violet) lights.

The cyan, magenta, and yellow dye images may be formed chemically in the three sensitized emulsion layers of multilayer color positive (Eastman Color, Anscocolor, etc.) or mechanically printed in exact registration on clear gelatin-coated stock by a dye-imbibition process employing three relief-image "matrix" printing films (Technicolor).

The first 3-color films were photographed on three separate negatives in a 3-strip camera used exclusively by Technicolor. Since the advent of multilayer dye-coupler color negative, however, the use of regular single-strip cameras for color production work has become universal. (Technicolor cartoons have always made use of the single-strip successive-exposure method, unsuitable for the photography of moving objects because of the color-fringing effects which would be produced.)

As a rule, the chromatically corrected lenses suitable for black-and-white filming on panchromatic negative are equally suitable for color photography. The focus-rack scale for color may be checked by photographing test patterns at various precisely taped-off distances through a green Wratten No. 61 filter on fine-grain panchromatic film. (This is a "10-times" filter with pan film in *either* sunlight or tungsten light.)

Multilayer color negative is very similar to multilayer positive. It provides a color image with the colors, as well as the brightness values, reversed. The uppermost emulsion records the blue-violet third of the spectrum and contains a dye-forming agent which produces a lemon-yellow image when the film is processed. This emulsion is coated over a yellow filter layer which prevents blue-violet light from reaching the underlying green- and red-recording emulsions, which develop to magenta and cyan images, respectively.

As Fig. 3 shows, the spectral response curves of these three color-selective emulsions roughly approximate the response of the hypothetical red, green, and blue color receptors of the normal human eye on the basis of the selected primary wavelengths.

It must be understood that the *negative lobes* of the visual response curves have no physical significance in any 3-color process, and must be neglected. It is physically impossible to produce negative values of light, which is what would have to be accomplished by a 3-color process capable of reproducing *all* of the extremely vivid spectrum colors as fully "saturated" as they are in an actual spectrum. The fact that even the best 3-color processes necessarily fail to reproduce the pure *spectrum* greens, cyans, blues, and violets with their *maximum* degree of vividness is not a serious handicap. Very few "reflectance colors" even approach the spectrum hues in purity; and most of the colors actually encountered can be rendered more vivid than they actually are by increasing the color contrast of the print. In many cases the subject colors are deliberately subdued in order to avoid a distractingly garish effect.

The fidelity of the colors reproduced on a motion-picture print depends upon the extensiveness of the gamut provided by the selected primaries, the correspondence of the three emulsion response curves to the calculated visual response curves, and upon the spectral effectiveness of the complementary-color subtractive dyes.

It is well known that even the best color-process dyes are far from perfect (the magenta dye absorbing some of the blue light it would transmit if it were a perfect dye, the cyan an appreciable amount of green, and the lemon a smaller amount of green). Because of these limitations of real dyes, the magenta is decidedly redder than a theoretically perfect (but nonexistent) magenta dye, the cyan is more bluish, and the lemon more deeply yellow.

Partial correction for the spectral deficiencies of subtractive dyes is nevertheless possible. The overall orange tint of processed Eastman Color negative and intermediate films, for example, is due to "color masks" which form superposed *reversed* yellowish and pink dye images to compensate for the unwanted blue and green absorptions of the print-film magenta and cyan dyes.

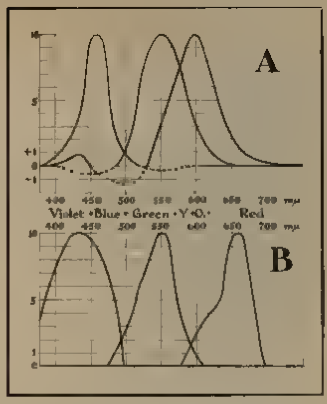


FIG 3—A Tricolor response of the normal human eye on the basis of 700, 525, and 460 millimicrons for the wavelengths of the red, green, and blue primaries. The negative lobes indicate color substractions which are physically impossible in any 3 color process. This means that even the best such color process, even though capable of reproducing an extremely wide range of colors, cannot quite match some of the pure spectrum colors in vividness.

B: Tricolor response of a widely used multilayer negative film.

When intensely colored objects are photographed at high light levels, the dyes forming their images in the print unfortunately become so reduced in concentration that much of their color-filter action is lost. The result is a whit-

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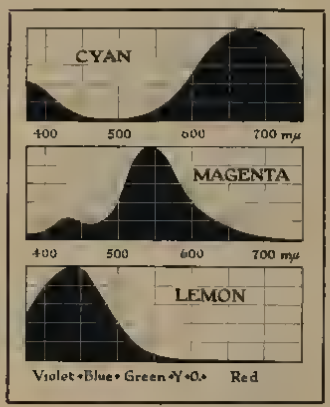


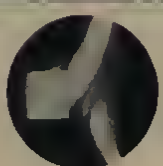
FIG 4—Absorption curves of the cyan, magenta and lemon yellow dyes commonly used for color-film images.

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WHEN SCENES are carefully detailed in the shooting script, they are invariably better photographed because everything is spelled out plainly for the camera crew. (Photo courtesy Aerojet-General Corp.)

BLUEPRINTING THE BUSINESS FILM

How careful pre-production planning can save money for both the in-plant and the business film producer.

By CHARLES LORING

IN THE PAST decade the volume of motion pictures produced for commerce and industry has snowballed to such a degree that this field of production now accounts for a huge and lucrative percentage of the total film exposed in the industry each year.

A small proportion of such pictures are produced by large organizations maintaining elaborate production facilities, but a much greater percentage of films for business are made by small producers all over the world—many of them representing the only source of film production close to certain important local industries.

To the in-plant or business film producer, caught between a low budget and the desire to make a picture that looks "big" on the screen, effective *pre-production planning* is a must. Good motion pictures of all types and categories are made, not on a sound stage but at a desk long before the cameras roll—and the business film is no exception. Blueprinting such a picture carefully can spell the difference between a good film and a poor one, as well as between profit or possible loss to the producer.

At what point should this blueprint of production begin? Actually, the first rough lines of structure are sketched in during the very first conferences between the producer and the client or, in the case of the in-plant film maker, the company's public relations man. This is a getting-to-know-you phase in which certain basic decisions must be made: What budget is available for the production? Is the picture to be sound or silent, shot in color or black-and-white? What is the proposed audience and special slant of the film? What cinematic style and techniques of production will best put across the point of the film? And, most important of all, "What does the client want to say in the film?"

Each of these elements will figure importantly in the blueprint of production and will dictate in some measure the ultimate character of the entire picture.

It is important to learn from the client in the very beginning just how much money he plans to spend on the proposed film. Most clients who have never sponsored a film tend to underestimate the cost of this medium, and it is dangerous to sell such a client on the idea of a super extravaganza only to discover later that he has in his budget only half the amount of money that it would take to produce the picture on the scale proposed. If the producer catches himself in such a trap he may end up making the film at no profit to himself just to maintain client good will, or (if he cuts down the scope of the film in order to keep from going in the red) he may find himself with a client who is disgruntled because he believes himself to have been misled by visions of a super epic and then made to accept something considerably less.

If the client is willing to name a certain budget figure, tell him that you will prepare a prospectus of the type of film that can be made for that figure and that you will present the prospectus to him as soon as completed.

If the client refuses to name a figure, then you as the producer must insist that he give you a very detailed resume of what he wants in that film. Clients are fond of asking: "What will a twenty minute picture cost?" The answer to that is that while the length of a proposed film will certainly figure somewhat in its cost, the various elements that are to go into that film are

Continued on Page 626



FIG 1—Author's sync-motor drive mounted on Bolex H-16 camera. Main support is bracket extending from camera base. The two toggle switches (arrow) control power to and also direction of the motor. Jack for sync-tone control is located at rear of switch box.

SIMPLIFYING THE SYNC PROBLEM

A.C. signal recorded on tape edge synchronizes camera or projector with the recorder.

By JAMES D. JONES

IN THE FEBRUARY and March, 1956, issues of American Cinematographer, James Whitaker described a "coincident sound" system for the projection of home movies with sound, using a projector augmented by a quarter-inch tape recorder. Synchronism between the two machines was maintained by means of a 60-cycle pulse which was fed to an auxiliary sync motor attached to the projector. The sync-control pulse was taken from the regular A.C. power line through a step-down transformer at the time the film was projected for recording, and the pulse tone was recorded simultaneously with the sound on the opposite edge of the tape.

Thereafter, whenever the film was screened, the amplified sync tone governed the speed of the projector, thereby keeping both film and sound tape in sync. Whitaker's articles did not explore the possibilities of using the equipment for recording "lip-sync" sound as movies are being filmed.

I became intrigued with the simplicity and low-cost features of Whitaker's system. I decided to explore its possibilities for providing sync sound in the production of semi-professional and documentary films. Having only limited funds, I built as much of the equipment as possible and made the system as practical and efficient as I could.

At the start of the project, I owned the following items. Bolex H-16 camera with an assortment of lenses, a tripod, Ampex 600 tape recorder, 4-channel mixer, microphone, monitor system

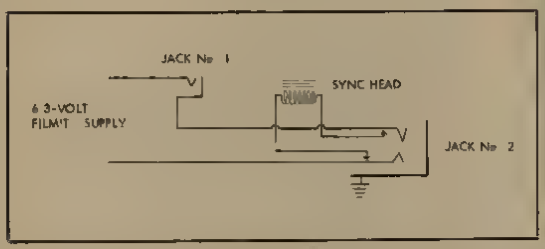


FIG. 2—Wiring diagram of modified circuit of the Ampex 600 magnetic recorder, shown at right, which provides additional jack on recorder panel to accept input from the sync-tone control on camera.



FIG 3—AMPEX 600 magnetic recorder modified for coincident sound recording. The sync-tone recording head is located between the capstan and the play record switch on the panel.

and a DeVry model RS 16mm optical-sound projector

The first step was modification of the tape recorder I mounted a half-track recording head on the front panel (See Fig 3) so that the pole pieces contacted the edge of the tape opposite the edge used for sound recording This head was wired to two ¼" phone jacks, as shown in the diagram (Fig. 2) Jack No 1 insulated from the panel of the recorder, provides a connection to the camera power switch, as will be described at length later. Jack No. 2 is so wired that when no plug is inserted, the recording head is automatically connected through jack No. 1 to the 6 3-volt filament supply. Plugging a patch cord into jack No 2 disconnects the 6 3-volt power and connects the head to the patch cord This cord extends to the sync-tone amplifier This completes the modification of the tape recorder

A small Bodine 60 R P M. sync motor, purchased from a government surplus dealer for $25 00 was modified to serve the dual purpose of driving my Bolex camera for double-system sound production of films and also, when necessary to control the DeVry projector so it would operate in sync with the tape recorder The motor's R P M speed, while not correct for driving the camera, could easily be geared up to 2-to-1 ratio for 16 fps or to 3-to 1 for 24 fps. So, a simple step-up gear system was added to the motor, which is visible in Fig 1 This, plus a simple mounting to fit the camera completed the mechanical assembly

Electrically the drive system is not complex The motor is a "capacitor start, capicitor run" type, and reversal of the motor is accomplished by means of a single-pole, double-throw switch incorporated in the wiring. The on off switch is a double-pole, single-throw type, with one section controlling the motor. The other is connected to a phone jack, which is the terminus of a cable that extends to and is plugged into the No 1 jack on the recorder. Thus, starting and stopping the camera automatically starts and stops the recording of the sync tone on the tape

The above paragraphs outline the equipment required for the method of sync sound filming described herein The actual use of the units in shooting a scene is outlined below

The tape recorder is set up and microphone placement is determined in relation to camera angle, etc The camera is then positioned in its desired location and both the camera motor and the recorder are connected to the same source of 110-volt, 60-cycle A C power A cable of the required length is then plugged into the jack on the camera motor and extended to the recorder where it is plugged into jack No 1 This hookup provides the sync tone recording on the tape The recorder is started and when it is up to speed the camera motor is started, thus energizing the sync head on the recorder The start of the sync tone indicates also the start of the shot on tape, and the sync tone functions again when the film is projected by keeping the projector (and thus the film) in sync with the taped sound.

In editing, the film frame with the start mark and the start of the sync tone on the tape are matched and the selected takes—both tape and film—are spliced in the desired sequence Some trial-and-error splicing may be necessary before perfect sync is achieved, but otherwise satisfactory matching can easily be accomplished

To screen edited film with its accompanying sound tape, the author uses the DeVry 16mm projector, unmodified except for a mount to hold the sync motor that is used on the camera when shooting (Fig. 4). The sync motor assembly couples to a drive shaft of the projector and thus serves as a governor to hold speed of the projector at either 16 fps or 24 fps, as desired. The regular projector motor is not disconnected but continues to function as the main motor power for the machine.

The exact setting of the projector speed control is determined by observing a stroboscope disc mounted on the projector, as shown in Fig 5, illuminated by a small neon lamp energized by the same power source used to drive the sync motor

The third unit required for this system is the sync amplifier, which, as its name implies, amplifies the sync tone on the tape before it is sent along to the sync motor The author uses a small 10 watt amplifier for this purpose to which has been added another stage of gain, thus producing about 110-volts at 500 ohms This stage of gain is virtually a copy of the microphone preamplifier in the Ampex 600 recorder,

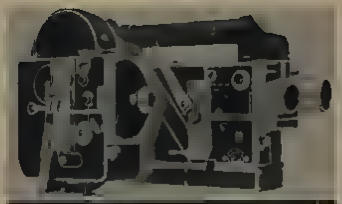
Continued on Page 639



FIG 4—The sync motor (arrow) that is used on the camera (Fig 1) is also used to drive and maintain sync of the projector. Motor mounting is designed to fit both apparatus



FIG 5—To check speed of projector for playback of sound films, operator illuminates stroboscope disc mounted on lower sprocket of projector using small neon glow lamp (All photos by author).



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PHOTOGRAPHING "BEN HUR"

Continued from Page 605

was able to calculate various combinations of colors in rapport with the Kelvin scale, adding or subtracting color when necessary. He thus was able to arrive at a norm through use of the designated corrective filters. With the aid of this meter, for example Surtees determined the exposure and filter to use in order to make a "sunset" shot at high noon.

In a similar way he solved the problems resulting from any deviation in the color temperature of light on actors' faces, where complexions had changed because of exposure to sun and wind. Such color temperature checks enabled Surtees to decide when a makeup should be changed and how much.

As the available Kodak CT filters were not entirely adequate to meet, in the additive color film process, the variations of color temperature under Italian skies, Surtees did some personal research with the view of combining certain Kodak CT filters with those of Photo Research Corp. To facilitate this step, the equivalent values of Kodak and Photo Research CT filters were determined as follows:

Kodak		*Spectra*
82C	equals	4½ T
82B	"	3¼ T
82A	"	2 T
82	"	1 T
81	"	1 S
81A	"	1 5/6S
81B	"	2¾ S
81C	"	3½ S

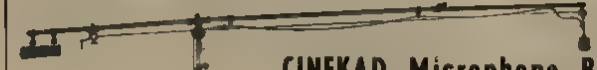
Thus, when at 9:45 a.m. the CT meter indicated 13 in the blue/red range and 6 in the green/red range, this added up to a color temperature of 5480° K. The meter chart showed that this required a 1T filter for the blue/red, and none at all for the green/red range where color temperature was normal. Translating the meter calibration, 1T indicated that a Kodak 82 filter would have to be combined with the normal 85 filter for proper color results at that time of day.

At 12 o'clock noon the same day, the sunlight registered the normal 5700° K on the CT meter, which required the use of only the 85 filter on the camera lens. But at 2:45 p.m., another meter reading indicated the color temperature of the daylight had declined to 5195° K. This called for using a Spectra 2T filter (or its equivalent, the Kodak 82A) in combination with the 85.

As with the studio's earlier production of "Ben Hur" many years earlier, the 1958-59 version was turned out by a production company divided into three units for flexibility and speed. Director William Wyler and Cinematographer Bob Surtees, heading the first unit, photographed most of the interiors for the picture and also supervised Units 1 and 2. Director Andrew Marton and Italian Cinematographer Piero Portalupi headed the second unit which concentrated on filming the chariot race sequence for the picture. The third unit was in charge of Director Richard Thorpe and Cinematographer Harold E. Wellman, A.S.C. This unit photographed the fight action scenes on the galleys, some of the chariot race scenes and did some retakes for the other two units.

The chariot race is perhaps the most dramatic action sequence in the entire picture, climaxing as it does, the terrific struggle between the two antagonists, Messala and Ben Hur. Altogether, five months were spent in shooting the chariot race scenes for a sequence that will run less than 10 minutes on the screen.

To take advantage of the predominantly sunny days of the Italian summer, Portalupi and his camera crew worked steadily from 6:30 a.m. to 5:00 p.m. daily. Two and sometimes as many as four Panavision-65 cameras were set up at strategic places around the Roman Circus set where the race was staged. The cameramen handling the secondary cameras were directed by Portalupi by radio intercom, while



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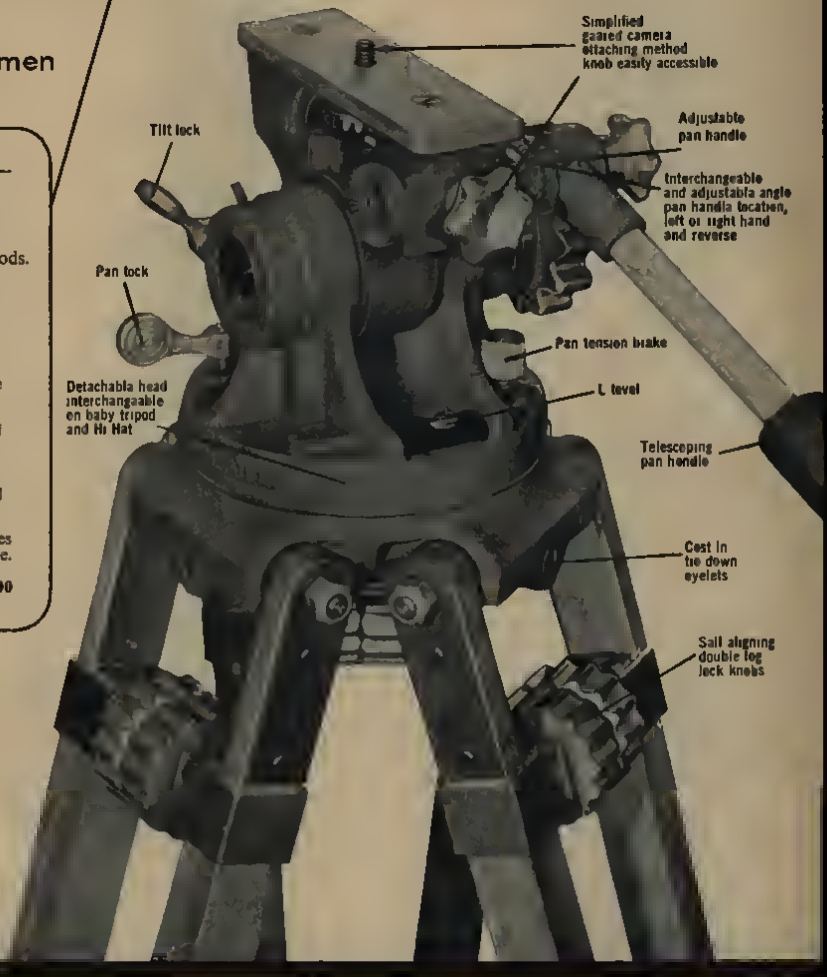
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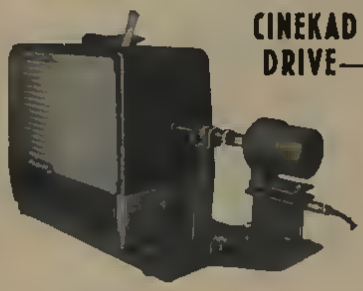
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Portalupi and his crew photographed the master shots.

The traveling shots of race action, made with the camera mounted on a speedy camera car, were the most difficult to make, according to Portalupi. Despite the fact the car was powered by a 300 h.p. engine and the Circus track was smoothed and watered down after every take, the camera car unavoidably slipped into the furrows made by the chariot wheels on their first turn around the track.

There was another problem, too. When shooting from the camera car as it circled the track, the lighting had to be compensated for, as it would change progressively from, say, flat lighting to cross- or back-light as the camera car traversed its oval course. As far as possible, this situation was minimized by altering the lens stop during a run to conform with the light, with exposures ranging between f/5.6 and f/11.

Color temperature changes also had to be compensated. A constant check on the light was made throughout the day and the necessary color correction filters employed when necessary.

To produce in the photography the illusion of great speed in chariot travel during the racing action, it was decided, after shooting a number of tests and screening them, to photograph these scenes at the slightly reduced speed of 20 f.p.s. instead of 24.

"When we were making chariot-race shots from a fixed position," said Portalupi, "where the chariots were charging directly toward the camera, it was observed that the effect of speed was greatly reduced, so we reduced the camera speed further, to 16 f.p.s., then gradually increased it to 20 f.p.s. again as the camera, now panning, followed the chariots and caught them going away. No such problem was faced when making the traveling shots of the race, however, as the camera car usually traveled at the same speed as the chariots."

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Both Portalupi and Director Marton were further guided in staging and shooting the chariot race scenes by a series of story-board drawings furnished them by the studio Also, they studied at great length the chariot race scenes in the first "Ben Hur" picture, which the studio made many years ago.

"We duplicated almost to the letter one scene in the original film, which seemed to us a most powerful one visually in spite of the passage of time," said Portalupi. "This was a pan shot made from a high elevation, with the camera following the chariots as they approached a turn around the Spina. (The Spina is a long, narrow platform accommodating spectators in the center of the Circus area.—Ed.)

To make this shot, the camera was mounted on one of two iron towers, which were about a hundred feet in height and built to provide the necessary elevation for another camera that was used to make matte shots The camera was mounted at a height of about fifty feet and at an angle of 45 degrees; it looked down upon one of the massive statues mounted on the Spina and provided a wonderful, unique view of the whole racing event

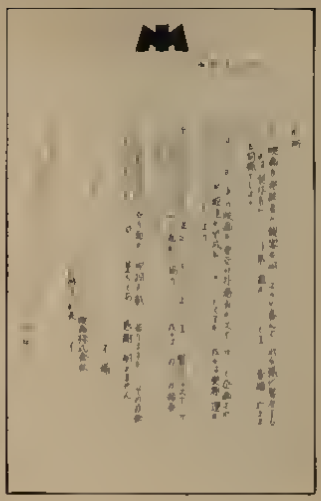
Cinematographer Wellman was assigned to shoot the fight sequences on the galleys Like Surtees and Portalupi, he also employed two or more Panavision-65 cameras for all key shots of action scenes This sequence was shot in and on "the tank" on the Cinecitta Studio lot in Rome. More than 600 actors and extras were employed in these scenes, according to Wellman, and the galleys were authentic replicas of the historic craft described in the famous novel, "Ben Hur."

To achieve the most dramatic effect pictorially, it was decided to give the encounter the aspect of taking place at dawn, which called for predominantly low-key lighting. Here frequent color temperature checks were vital to insure scenes that would integrate perfectly with the rest of the picture.

Prior to going to Rome for this assignment, Wellman shot all of the miniatures required for the galley fight sequence on the "lake" on MGM's back lot in Culver City

Since completion of the photography of "Ben Hur," the cutting, editing and dubbing of the vast amount of footage shot in Italy has been going on at a feverish pace so that the picture will be ready for its world premier sometime in November

Bob Surtees has remained in Europe where he has enjoyed a well-earned vacation. Not content with being idle long, however, he recently undertook an assignment to direct the photography of "Bay of Naples" in Italy for Paramount Pictures, on loanout from MGM. ■



COLOR IN MOVIES, TV

Continued from Page 617

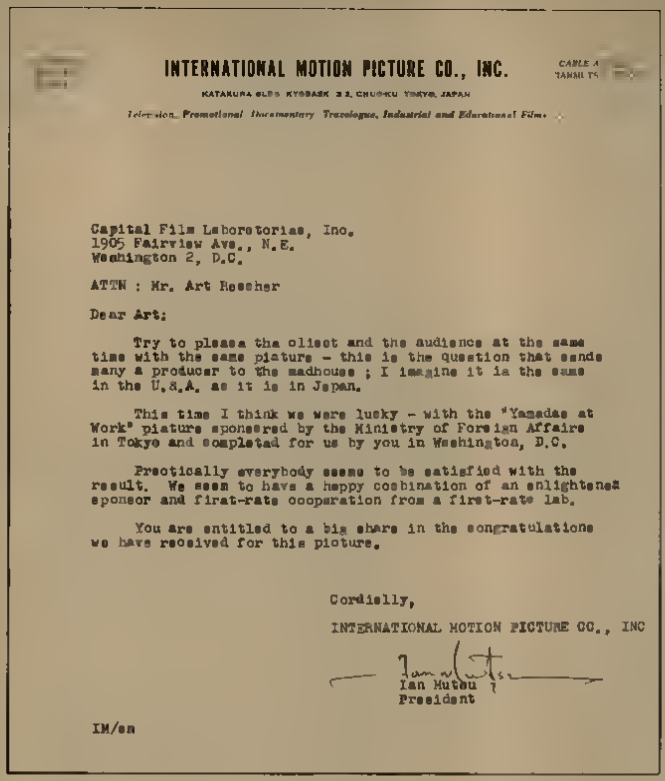
ening, or desaturation, of the images of such very bright, but intensely colored, objects as neon signs, traffic lights, and colored clothing upon which patches of direct sunlight fall when the subject is photographed in partial shade.

The desaturation effect does not occur in additive color (such as color TV), but it is only rarely detrimental to the overall color impression inasmuch as the eye accepts some degree of color desaturation at excessively high light levels as a normal visual phenomenon.

As mentioned in Part I, color film is embarrassingly literal in regard to the color of set lighting. Since present day professional color negative is balanced for the "color temperature" of tungsten illumination (3200° K), high-intensity arc lamps used on sets in conjunction with "inkies" must be filtered by straw-colored gelatins (such as Brigham Y-1), else the areas illuminated by them will photograph blue!

Similarly, the use of regular color negative in daylight (or HI arc light alone on interior sets) requires a yellowish filter for the camera Wratten No. 85 is usually recommended This filter is especially satisfactory for outdoor use because it "cuts off" in the violet rather sharply at about 390 millimicrons, thus effectively preventing the exposure of color film to ultraviolet radiation For a slightly warmer ren

For what he said please turn page.



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dering of exteriors. Wratten No 85B may be employed

Fluorescent lighting units (common in TV studios) have no place on color motion-picture sets, and must *never* be used for color filming regardless of the daylight-white appearance of their radiation The spectral distribution of this radiation is very irregular. It is very weak at the red end of the spectrum and contains the strong yellow-green and blue-violet lines emitted by the mercury arc As a result, many colors photographed under fluorescent illumination are grossly distorted in the reproduced pictures

TO BE CONCLUDED

BLUEPRINTING THE FILM

Continued from Page 619

much more significant budgetwise If the client finds this point difficult to comprehend, it should be pointed out that while a pound of feathers and a pound of gold both weigh the same, there is certainly a difference in cost due to the factors that make gold more valuable than feathers

Translating this into filmic terms, certain cost factors must be clearly analyzed for the client One important item is whether to shoot in color or black-and-white Color is, generally speaking, more effective for most commercial subjects because it enhances visual interest. However, it is also more expensive, not only because the raw stock costs more, but because the relatively slower color emulsion requires more light (therefore, more lighting equipment) for filming interior scenes Also, filming usually takes longer in color due to the extra precision needed to insure proper exposure, color harmony, etc. The added cost of color for an average subject ranges in the neighborhood of 15 to 20 percent

The second item to be considered is that of sound. Few business films today are made without sound, but in the case of an absolutely rock-bottom budget this may be the only alternative. Narrated sound is the least expensive and is more readily available to the small producer since there are recording studios in most areas that specialize in rendering this service Direct or "lip-sync" sound is much more complicated and expensive because it demands that the producer either rent or buy costly single or double system sound equipment Also, if he wants a truly professional recording job, he

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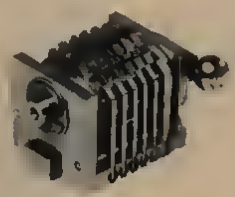
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Other budget considerations include (a) The number of locations involved and the distances between them, (b) Whether there is a preponderance of exteriors (which can be shot without auxiliary lighting equipment) or interiors (requiring elaborate electrical and lighting installations); (c) The number of "actors" required and whether or not these must be professionals; (d) Animation, if any, titles; (e) Complicated special effects; (f) A background musical score; (g) Expensive sets, costumes or props that must be bought, fabricated or rented, etc

Obviously all these details must become a part of the initial blueprint so that the producer may intelligently contract to produce a film that will meet the client's needs, stay within the available budget, and assure the producer a fair profit for his labors.

The producer must constantly remember in pre-planning that time is indeed money. Even if he is a jack-of-all-trades who functions as a one man studio, he will find that set-ups, which require an inordinate amount of time to execute, will run his overhead up prohibitively and also prevent him from deriving the maximum return for the amount of time and effort he expends on the project

Time To Write Script

After the various elements of the proposed film have been blueprinted to the point where there is a close meeting of minds between client and producer — and after the budget has been set and approved—then and only then should an actual shooting script be written. If the producer does his own scripting, as many do, he should follow the blueprint he has sketched up to that point and make sure his shooting script is a faithful expansion of that outline, neither adding nor subtracting elements that might change the cost pattern Clients often try to add extra trimmings during the scripting stage ("Five minutes of animation would do wonders for that last reel, don't you think?")—but they should be reminded that this item was not included in the approved budget (which should be in writing and signed by both parties). Where the client insists on having animation, etc., prepare and submit a supplemental budget that will show him what the extra cost will be.

Where the film producer hires a writer to expand the original outline he should constantly ride herd on the fellow to make sure that he doesn't get carried away with his own words and sneak in an extra sequence involving a cast of thousands Words are cheap, translating them into celluloid can get expensive

The shooting script should be as detailed as possible, including not only the action and dialogue but a precise description of sets, props, special effects, etc. Extra time spent in writing a detailed script will pay off importantly when the next stage of blueprinting is reached.

Planning The Shooting

When the final shooting script has been approved, the producer or his assistant or both should analyze the script most carefully and prepare lists of the separate sets, locations, actors, changes of costume, props, special effects, etc., along with the numbers of the scenes in which they are required If the shooting script has indicated all these elements in detail such a breakdown should not be very difficult

Once the breakdown is complete, pre-planning should begin immediately to make sure that all the elements of production will be ready when and where needed As part of the blueprint, the breakdown lists should be set up in the form of check-charts so that the producer will know at every step of pre-production which elements have been secured and which still remain to be locked down

Location sites away from the studio should be scouted and checked to make sure that they are suitable and that no insurmountable problems exist It is especially important that proposed interior locations be inspected for the availability of sufficient electrical current to run lights, cameras and sound For a film to be shot in black-and-white existing circuits will often suffice, but for color filming, whenever scenes of wide scope are to be filmed, arrangements may have to be made to secure additional power. In such cases, when shooting in large buildings or factories, sufficient current may be obtained by "tying" auxiliary cable directly into the main switchbox Here it is advisable to have this done by the electrician or maintenance man on the premises, since he is familiar with the board and its connections If such an arrangement cannot be worked out, then a transformer or generator should be located in advance so that shooting may proceed on schedule.

Where actors are to be used, they should be interviewed and their availability verified far in advance If, instead of professional actors, you plan to use personnel employed by the client (a procedure which often saves money as well as lending the film an authentic quality), interview these people to make sure that they are reasonably photogenic and are able to handle whatever dialogue they may be given

What sets may be required should be constructed. Special props and costumes should be located, or fabricated if they are not available on rental. Any special camera, lighting or sound equipment required should be pinpointed and reserved far in advance

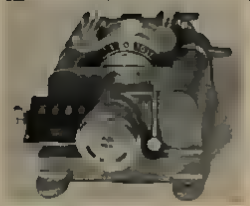
The final step in blueprinting is setting up the shooting schedule, or calendar of production. The objective here is to schedule the photography in order to get the best result on film in a manner that will save both time and money

Shooting in sequence is rarely the most efficient or economical film production method, and it is almost never done in professional production Generally speaking it is wise practice to schedule a few relatively simple and less important sequences to be shot first, so that cast and crew may get used to working together; also any technical bugs which become evident early in production may be worked out in a relatively painless manner. Next, the more difficult or demanding sequences should be shot while cast and crew are still fresh and enthusiastic about the project Leave for last the routine sequences which will not suffer too much if the creative flame is burning low or if you find yourself running out of time and/or money.

Grouping Scenes For Economy

In setting up an effective shooting schedule it is advisable to group together scenes that are to be shot in a common locale or with the same actors, even though such scenes may be widely separated in the continuity of the script itself. For example, if Scenes 10, 53 and 102 all take place in some distant locale it is common sense to shoot all three scenes at the same time rather than to make three separate trips to the location. Similarly, if a high-priced actor is engaged to appear in Scenes 5-18 and 117 135, it is logical, all other considerations being equal, to schedule all his scenes together rather than keep him waiting around for weeks on salary

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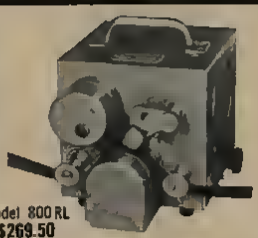


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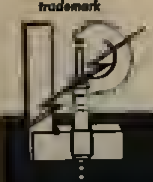


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until it is time to shoot his subsequent scenes.

In planning the shooting schedule for a commercial or industrial film in which there are both interior and exterior sequences, allowances should be made for possible inclement weather. Where exterior filming is scheduled, an interior "cover" set should also be ready so that the company can move indoors and continue shooting should the weather change and prevent shooting outdoors.

The last stage of blueprinting involves the processes that take place after shooting is completed. These include developing of the exposed footage, selection of print takes, work printing, edge-numbering, editing and scoring, sound re-recording or dubbing, the filming of titles and inserts, and the timing of the first or "answer" print. The producer must get to know these facilities so well that he can accurately estimate how long each process will take. Only in that way can he give his client a definite promise that the film will be completed on a specified date.

The importance of proper pre-planning in the production of business films cannot be too deeply stressed. The time spent in blueprinting such films in advance is a wise investment when compared with costly time that might be lost once the film is in production. The successful producer of commercial and industrial films does not take chances. He plots his course at his desk long in advance of shooting—for that is where good business films are made.

"REFERENCE WHITE"

Continued from Page 614

operate within stringent limits; *therefore the correct detail must be on the film!*

Here, then, is where the breakdown occurs in communications between the film producer and video operator.

Where is this means of communication to be found if not in the picture on the monitor? Surely this should be the proof of the pudding. But, to repeat, what the video operator sees when the spot whisks past his eyes during the frenetic activity at the time of station break, may not be what the film producer wants the home viewer to see!

The video operator gets much of his information from the wave-form monitor that is located generally beneath the picture monitor in the television control room—the wave-form monitor being something of an analyzer of the picture in terms of electrical transmission characteristics. The video operator cannot exceed certain levels on his wave-form monitor, regardless of what his incoming signal is — say, in this case, from a film — without seriously upsetting the transmission.

This isn't all. Films that look great when projected on a screen may look bad indeed when transmitted through a television system. In general, with a good film projector-screen system—that is, a bright light source in the projector and a good white screen which will yield a standard screen brightness—brightness ranges of more than 100 to one can be perceived easily in the screening of a well-photographed film. This means that detail in both white objects and black objects can be seen when the relative brightness from white to black is 100 to one. In other words, detail in the nuances of "whiteness" in, say, a white curtain can be seen at the same time that the differences in "blackness" of a man's tuxedo can be seen. The relative "whiteness" of the curtain is *"100"* in respect to the "blackness" of the tuxedo of *"one."*

In contrast to this, the television system is capable of handling a scene or signal brightness range of only 30 to one. This is influenced by many things including the optical and electrical characteristics of the television receiver, and the fact that most television viewing is done with much more ambient room light than is found in a film screening room.

Thus the picture mentioned earlier that looks great in the viewing room, would suffer in comparison when telecast. All of the subtle shadings of white in the curtain would disappear in telecasting—the whole curtain would just be white. Shadings of black in the man's tuxedo would also disappear when telecast—it would just be black. In other words, whites and blacks would be "compressed"—which is the word the television boys use for this effect. The only shadings that would be telecast would be those encompassing a 30 to one range.

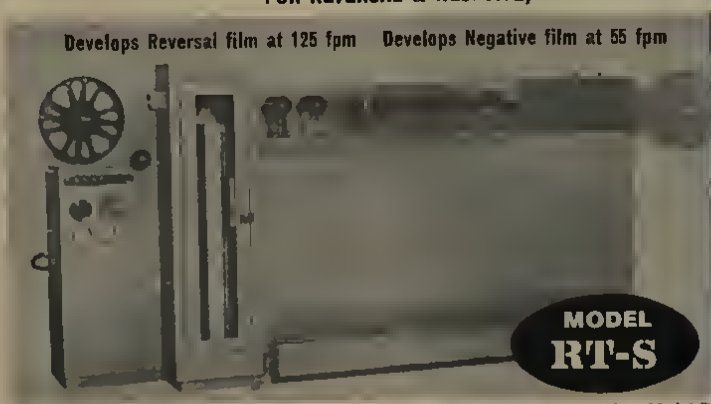
Now here's the rub: The transmission operator *could* set his video level so that the curtain would look pretty good, with the subtle shadings of white visible. But then the tuxedo would be flat black and perhaps several other objects in the scene, which looked grey when seen in the viewing room,

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would be out of sight in black Conversely, the operator could set his video level so that the *shadings* in blackness of the tuxedo might be seen Then the curtain would be white and undoubtedly the pretty girl's face would also appear so white she'd look like Dracula's secretary Generally, the video operator sighs and sets his video level to a good flesh tone and lets the chips fall where they may—so long as the FCC is satisfied.

There are two positive actions which can be taken to insure maximum quality in TV film transmissions. Specifically, this is the use of "reference white" and proper lighting ratios in producing filmed TV spots

I. If the film producer:

a) includes an object in the scene whiter or brighter than any other significant (from a dramatic or advertising point of view) object or flesh tone in the scene.

b) makes sure that his brightness ratio does not exceed 20-1. (Product gamma boosts the contrast in the final print by a factor of 1 5x to 30 to one—the outside limit of brightness

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contrast that the TV system can handle without compressing or "electronically averaging" the gray scale.)

11. The video engineer will be able to peg "reference white" at one volt, and all the intermediate tones will fall into the proper relationships, as originally intended by the film producer.

One other consideration that should not be overlooked is the importance of screen-reviewing commercial and entertainment TV films under conditions approximating as closely as possible ultimate video viewing conditions. How many times has a sponsor pleased with initial screenings of the answer print—stormed when he saw the same film on his home TV set? There's one way to avoid this unpleasantness: Demonstrate the print on a TV system for the sponsor. Or, if such facilities are not readily available, screen the print on a projection screen no larger than the average TV screen.

In summing up this discussion, Workshop spokesman John Stott said: "In a sense, here, we are over-simplifying. Obviously, use of 'reference white' and proper brightness ratios will, to a large extent, be dictated by the dramatic requirements of individual scenes. In some cases, for example, it may not be possible to devote anywhere near the suggested 10 per cent of screen area to 'reference white.' However, if some bright object can be included in the scene—possibly a handkerchief or a glimpse of white shirt—it will make for better results where it really pays off — on the home receiver."

FOG MAKER

Continued from Page 606

above. Type 1961 is a small compact unit which is used by many Hollywood studios where it provides a useful tool for the Special Effects department. It is powered by a 110-v, 60-cyc. A.C. motor instead of pulse-jet.

Type 1993 is the "Senior" model for use where fog or mist is to be produced in great quantities. The unit can produce sufficient vapor to create the effect of ocean fog over a large area or to simulate a volume of smoke issuing from the windows of a burning building. The generator or dispensing unit is semi-stationary and is usually connected by a hose to a 55-gallon drum that contains the fog-making compound. The generator unit will operate for a period of five hours on about 5 gallons of fuel.

The smaller units are ideally suited to the needs of the small, independent industrial and TV film producer, while larger studios will find any one of the three models suitable to the average requirements of general film production.

CLOUDS MADE TO ORDER

Continued from Page 611

bright. This characteristic provides a means of producing bright, fluffy "clouds." Obviously sky-correcting filters are not used, for if the sky is darkened by filters, the brilliancy of the "cloud" is destroyed. An appropriate negative of a skyscape that has been exposed with good filter correction is chosen. The view should have a perspective and cloud arrangement that will later form a pleasing composition when a transparency made from the negative is combined with an actual foreground setting. When making the positive transparency, the lower portion is "dodged" off so that the foreground setting may be photographed through this portion which is completely clear and transparent.

The transparency is set up before the lens of the camera, as illustrated in the accompanying photo, and is adjusted so that the horizon of the transparency is in proper relation to the horizon of the actual scene. A wide-angle lens is employed and the smallest lens-stop possible is used so that the transparency and the actual scene may be in the same relative focus. In bright sunlight, stops from f/14 to f/22 are usually desirable. As wide-angle lenses at small stops have great depth of field, the focus may be set considerably forward of the actual objects in the scene, so that the transparency and the most distant parts of the actual scene may be in equally sharp focus. Coated lenses are of decided benefit to the system because of the better definition, crisper images, and the lack of the "hot spot," often encountered when wide-angle lenses are stopped down greatly.

Because the process is invariably used on location where transportation is an important factor, the relatively small size of 11 × 14 inches was established for the transparencies. For stationary scenes the transparencies are placed about 18 inches from the lens. For panoramic scenes a device is employed that accommodates transpar-

ency films 16 × 40 inches in size. Films are used because they may be curved to the radius of the panning camera and thus be at a uniform distance from the lens To overcome displacement or "slippage" the camera is so mounted that the nodal point of the lens is at the axis of the vertical tilt and panoram For the stationary set-up the transparency is attached to the usual matte-box supports, while for the panoramic attachment an auxiliary plate is introduced between the tripod and the panoramic head. To this plate is attached the bolder for the curved plates, for obviously they must remain stationary while the camera is panned across the transparency.

From the back of the plate to the matte-box a bellows is fitted to exclude any rear reflections, while the usual umbrella is all that is necessary to keep any direct light from hitting the front of the transparency.

This invention has been in use since late in 1939, and many of the productions of 20th Century-Fox studio have been released with cloud scenes made by this process. In many cases artificial cloud scenes are edited in with real cloud scenes, and even the cameraman who photographed them both is afterward often at a loss to tell which is which

Besides the great advantage of being able to create pictorially beautiful scenes under unfavorable circumstances, the economic importance of the method is very great. In one production, for example, some forty of the scenes were made in this manner. If the clouds had been put in by the

Continued on Next Page

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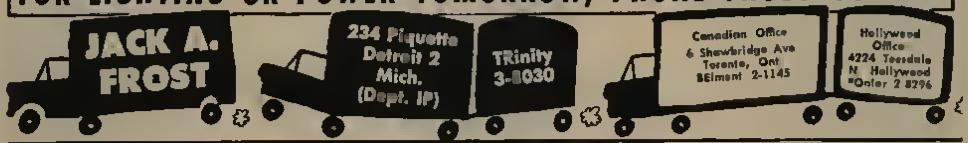
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matte-shot method the cost would have run into many thousands of dollars The complete outfit that was used cost less than $100 The set-up is quite simple and is accomplished almost as rapidly as an ordinary set-up. The camera man has the visual effect before him on his groundglass After adjusting the transparency to fit the setting, he is ready to make the scene. No further tests or experimentation is necessary No alteration of the negative is necessary, and it is processed in the usual way.

Clouds that fit the mood of the scene may be selected at will Bright fleecy clouds may be used for the usual run of scenes or sombre, threatening formations to indicate approaching storm or trouble as the mood requires It is quite practical to give movement to the clouds by slowly moving one or more plates across the field as the scene is being taken. However, in the majority of cases this is unnecessary for in editing the scenes do not remain long enough on the screen to detect motion

In addition to simplicity and economy, the method has the advantage over the matte-shot method of being able to place action over the sky area In the matte-shot and duping methods, it is necessary to keep all action below the horizon, lest such action run over into the division line when the sky portions are later exposed in The cloud portions of the transparencies are ordinarily perfectly clear, only the areas between clouds having any density. As long as the action stays within the "cloud" it may be placed anywhere in the sky Buildings, steeples, moving trees, and the like may extend over the horizon. When it is known that close-ups are to follow extreme long shots in the same sequence, a suitable cloud plate is chosen so that the action may be properly composed in both Dark objects or silhouettes may extend through the sky portions with no "ghosting" whatever, for they are but obstructions to the printing light of the sky.

As the intensity of the skylight varies greatly, from a direct frontlight to an extreme back-light, a great number of transparencies of different densities would be required to suit all such conditions if some means of control were not possible. Such a control is provided hy a graduated neutral-density filter. For front-lighted and side-lighted subjects the light is relatively uniform and control is seldom necessary For back-lighted subjects the sky, hence the printing light, varies considerably from sunrise to noon and on to sundown. For such shots we carry two densities of the same plate Adjustments between these densities are provided by the graduated neutral density wedges. If the sky is extremely brilliant and the transparency is rendered too light in relation to the foreground, the neutral-density filter is adjusted so as to retard the sky area only When the transparency is rendered too dense in relation to the foreground, the filter is inverted so as to retard the foreground area, allowing the sky area to "print up."

Location kits contain about twenty different transparencies, including examples of front-lighted, side-lighted, and back-lighted clouds. In some the composition is arranged so that buildings, trees, etc., may extend over the horizon on one or both sides As the plates may be reversed left to right to suit the composition or lighting conditions, the number of plates required is thereby reduced. From time to time new transparencies are made, and before being put into production their densities are tested photographically. Those that meet approval are put into the location kits. Needless to say this system has the hearty approval of the cameramen. No longer do they dread having to photograph exterior scenes on cloudless days. The directors likewise, realizing the importance of pictorial beauty in the productions, have been most cooperative in arranging action within the limits of the method

This system is not intended to replace real clouds It does, however, offer a fine substitute when nature has not been generous. Even when there are real clouds in the sky, the scenes may have to be photographed at angles that do not include the clouds Edited together, scenes with and without clouds are inconsistent. This method fills in the gaps. Dramatic moods may be created by choosing suitable cloud formations regardless of the actual sky conditions at the time Hazy skies, which are so different to control with color correcting filters, make no difference to the transparency, which requires only a printing light whether it be hazy or otherwise By using suitably toned or dye-toned transparencies the method may be applied to color photography

Rear-projection plates may be made at any time after or before the regular production long-shots have been made Using the same transparency for both purposes guarantees that the identical cloud effects will prevail in each when the final scenes are edited in sequence.

While it is impossible to discuss here all the adaptations of this synthetic cloud-making system, its very simplicity makes it a practical tool for the independent film maker as well as the Hollywood studio Today, it is regularly used at 20th Century-Fox studio, where frequent improvements in the technique and the equipment have kept it abreast of modern cinematographic developments ■

TRAVELING MATTE PROCESS

Continued from Page 613

monochromatic lighting of the backing he used, color separation negatives may be obtained, of which two resemble Fig. 4 and one resembles Fig 10 A print of Fig. 10 gives Fig 9

The fundamental objection to both the above methods is, however, that although Fig. 6 is geometrically identical to Fig. 4 it is not necessarily the same in image content.

Fig 11 portrays a man standing in front of a window, through which is seen a landscape and in which is seen a reflection of the man Fig. 11 comprises the separate components Fig. 12 and Fig 13 The reflected image in Fig 12 has no opacity and must therefore be superimposed without matting on the landscape of Fig. 13. The matte required for Fig 12 is therefore shown as Fig. 14, for which the appropriate negative is Fig. 15 Fig 15 can only be derived from the property of opacity in the foreground scene of Fig. 12: that is, a photograph must be made of an illuminated backing in front of which is placed the unilluminated foreground Similar considerations apply to the production of mattes of transparent objects, tracery, smoke, rain, etc., all of which may require double-exposure in the printing of the composite scene.

The production of a composite scene requires therefore the following initial steps: (i) a straight photograph of the background, (ii) a photograph of the foreground in front of an unilluminated backing, (iii) a photograph of an illuminated backing in front of which is placed the unilluminated foreground.

The process which will now be described is suited to the creation of all those types of scenes which can be

separated into foreground and background components with one exception—namely, scenes in which some feature of the background is reflected in a part of the foreground, such as a view through the windshield of a car, in which the sky is seen reflected in the top of the car's hood Here, we have no clear division of the scene into dissociated components The reflection in the hood of the car must be derived directly from the background, and such a scene might be better produced by some alternative process such as back projection. In practice, however, this scene could readily be "cheated" by making the surface of the hood mat and so eliminating the unwanted reflection.

It is now required to produce the three component images detailed above. The first of these, a straight photograph of the background. presents very few special problems Such considerations as do arise are matters of detail and need not be considered at this stage.

The second and third component images are in effect different aspects of the foreground and as such must be produced simultaneously There are processes which produce these two images alternately, in association with intermittent lighting arrangements. Such a technique inevitably results in time-parallax between the two series of images and prevents their satisfactory superimposition, leaving in general a "line" around any moving foreground objects

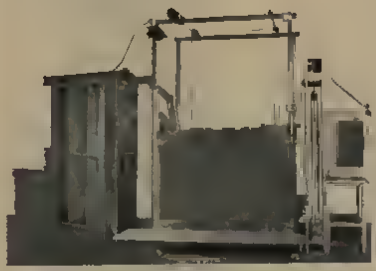
The successful outcome of shooting scenes by this process depends on the amount of prior thought which has been put into their conception. The planning of a composite scene requires not only some knowledge of the mechanics of the process, but more especially the ability to think in terms of composition and perspective This faculty being the prerequisite of the art director, he is the most suitable member of a production unit to plan the scenes in detail. He is governed in this operation by the producer and director, and assisted by the traveling matte technician, whose responsibility it is to supervise all aspects of the photography of traveling matte foregrounds Attention must be paid to the correlation of perspective between the different components of a composite scene This is best attended to on the drawing board and not left to be worked out on the studio floor.

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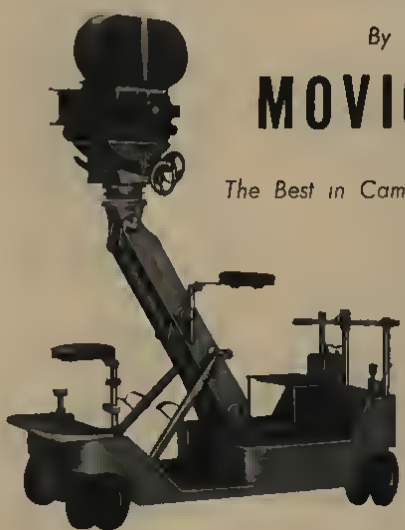
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Shooting the foregrounds proceeds at much the same pace as shooting straight scenes, a rate of eight set-ups per day having frequently been attained. The exposed negative is sent to the laboratory for development, and foreground rushes are seen the following day. Both negatives are retained at the laboratory.

Shooting of backgrounds may proceed independently and is governed by the rules which apply to the shooting of process material in general. It is desirable to expose a full frame, as this allows the background scene to be reversed (left to right) without interference from the sound track area. Backgrounds are in general preferably shot *before* the foregrounds. During shooting, records of their set-ups are made on specially-designed forms, which are then of direct assistance to the art director in planning the foreground sets.

When both foregrounds and backgrounds have been shot, it is then possible for instructions to be given to the laboratory for producing the composites. These new negatives are given new slate numbers and take their place among the rest of the material shot for the production. The proportion of a feature film which is made by this process is frequently anything up to 10 percent of the total running time of the film.

The process is now well established in the United Kingdom as a practical aid to film production. Some use of it has also been made by overseas producers, and it seems probable that its applications will continue to expand.

Traveling matte is frequently compared with *back projection*. To a certain extent, both processes have similarities, but they have at least as many differences. To compare them in detail would be a lengthy task, but in general it may be said that if the background of a scene is as important as the foreground from the story-telling aspect, then traveling matte is preferable. If, however, the background is subservient to the foreground action, or if direct connection between foreground and background is required (as in the example of the reflection in the hood of a car), then back projection is preferable. On the average, it may be said that of three different process shots, one is best done by traveling matte, one by back projection, and the third could be done equally well by either process.

The general effect of using the traveling matte process is to create a scene in which the background has production value. It is thus very suitable for scenes depicting ships at sea, aeroplanes in the sky or vehicles on land. Its application to the technique of deep-focus photography is obvious, since it enables scenes to be created of apparently very large depth of field (Fig. A). In trick work, it enables live artists to be portrayed in conjunction with models, the models being magnified to any desired scale. Apparently dangerous situations can be portrayed (Fig. B), such as an artist suspended over a busy street. It enables scenes to be created which have no counterpart in real life, such as the same person appearing twice or several times in a given scene (Fig. C); it can, in fact, be readily used to enable an artist to pass both before and behind himself in the same scene — for example, if he were supposed to be boxing or fencing with himself.

It would be difficult to list all the possible applications of this process, both serious and comic, which are often revealed only when a script writer is preparing a script. A knowledge of what is possible should, however, enable many stories to be scripted which, for lack of suitable production facilities, might otherwise never reach the screen.

The process described above is currently in use at Pinewood Studios, England. During the years 1950 to 1956, it was used in some 87 feature films made both in Gt. Britain and Europe. Many of these films incorporated over 1,000 ft. of composite negative produced in this manner. The process is available for use by any film producer on application to the Rank organization, London, England.

REFERENCES

(1) Howard, T. W. *J. Brit. Kinematogr. Soc.*, No. 3, 77. 1942

(2) Levenson, G. I. P. and Wells, N. *Brit. Kinematogr.* 19, No. 5, 139, 1951

THE FOREGOING is the first of two articles by Mr. Hault dealing with the Traveling Matte process. It first appeared in *Science and Applications*, journal of the Royal Photographic Society of Great Britain, in 1953. The second article, Traveling Mattes In Color, written exclusively for *American Cinematographer*, will appear here next month. —Ed.

PHOTOGRAPHIC ASSIGNMENTS

Continued from Page 598

REVUE STUDIOS

MACK STENGLER, ASC, "Leave it to Beaver"* (Gomalco Prods.) with Barbara Billingsley and Hugh Beaumont. Norman Tokar, director.

CLIFFORD STINE, ASC, "Hell Bent for Leather" (C'Scope & Color) with Audie Murphy and Felicia Farr. George Sherman, director.

ELLIS THACKERY, ASC, JOHN RUSSELL, ASC, EMIL HARRIS, "Shotgun Slade"* (Revue Prods.)

RAY RENNAHAN, ASC, LIONEL LINDON, ASC, JOHN RUSSELL, ASC, "Laramie"* (Revue Prods.)

RAY CORY, ASC, "Riverboat"* (Revue Prods.).

WILLIAM SICKNER, ASC, "Bachelor Father"* (Bachelor Prods.) with John Forsythe.

BENJ. KLINE, ASC, "Wagon Train"* (Revue Prods.) with Ward Bond.

LIONEL LINDON, ASC, BENJ. KLINE, ASC, JOHN WARREN, ASC, ARCH DALZELL, "Markham"* (Revue Prods.) with Ray Milland.

ELLIS THACKERY, ASC, LIONEL LINDON, ASC, RAY CORY, ASC, WILLIAM SICKNER, ASC, "Staccato"* (Revue Prods.)

WILLIAM SICKNER, ASC, JOHN RUSSELL, ASC, "The Deputy"* (Revue Prods.).

RICHARD RAWLINGS, ELLIS THACKERY, ASC, "M Squad"* (Latimer Prods.) with Lee Marvin.

RAY COSY, ASC, RAY RENNAHAN, ASC, "Mickey Spillane's Mike Hammer"* (Revue Prods.)

ELLIS THACKERY, ASC, "General Electric Theatre"* (Revue Prods.)

TWENTIETH CENTURY-FOX

JAMES WONG HOWE, ASC, "The Story on Page One" (C'Scope, Co. of Artists Prod.) with Rita Hayworth and Anthony Franciosa. Clifford Odets, director.

SAM LEAVITT, ASC, "Seven Thieves" (C'Scope & Color) with Edward G. Robinson and Rod Steiger. Henry Hathaway, director.

LEO TOVER, ASC, "A Journey to the Center of the Earth" (C'Scope & Color) with Pat Boone and James Mason. Henry Levin, director.

MAURY GERTSMAN, ASC, "Adventures in Paradise"* with Gardner McKay and Weaver Levy.

LEON SHAMROY, ASC, "Beloved Infidel" (Co. of Artists Prod.) with Gregary Peck and Deborah Kerr. Henry King, director.

CHARLES CLARKE, ASC, "Hound Dog Man" (Co. of Artists Prod.) with Stuart Whitman and Carol Lynley. Don Siegel, director.

FLOYD CROSBY, ASC, "The Last Rookie" (C'Scope, APT) with Tommy Noonan and Pete Marshall. George O'Hanlon, director.

WILLIAM DANIELS, ASC, "Can Can" (Todd AO, Jack Cummings Prod.) with Frank Sinatra and Shirley MacLaine. Walter Lang, director.

JORGE STAHL, JR., "The Girl in the Red Bikini" (Edw. L. Alperson Prod., C'Scope, shooting in Majorca) with Mark Stevens and Joanne Dru. Byron Haskins, director.

JOE MACDONALD, ASC, "Five Fingers"* with David Hedisen and Luciano Paluzzi.

WARNER BROS.

JAMES DROUGHT, Commercials*

Continued on page 638

CLASSIFIED ADVERTISING

RATES Ads set in lightface type, 10c per word, minimum ad, $1.00. Text set in lightface capital letters (except 1st word and advertiser's name) 15c per word. Modified display format (text set in boldface type, capitals or upper-and-lower case) 90c per line. Send copy with remittance to cover payment to Editorial Office, American Cinematographer, 1782 No. Orange Drive, Hollywood 28, Calif. Forms close 1st of month preceding date of issue. No discount on Classified Advertising.

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PHOTOGRAPHIC ASSIGNMENTS

Continued from Page 636

WARNER BROS.

ARTHUR ARLING, ASC, Commercials*

BERT GLENNON, "Captain Buffalo" with Jeffrey Hunter and Constance Towers. John Ford, director

JOSEPH BIROC, ASC, "Ice Palace" (Shooting in Alaska) with Richard Burton and Robert Ryan Vincent Sherman, director

EDWARD COLMAN, ASC, "—30—" (Mark VII) with Jack Webb and William Conrad Jack Webb, director

JACK MACKENZIE, ASC, RALPH WOOLSEY, ASC, ROGER SHEARMAN, "The Alaskan"*

RAY FERNSTROM, ASC, "Cheyenne"* with Clint Walker

HAROLD STINE, ASC, REX WIMPY, ASC, WESLEY ANDERSON, ROGER SHEARMAN, "Maverick"* with Jack Kelly

EDWIN DUPAR, ASC, JACK MACKENZIE, ASC, RALPH WOOLEY, ASC, RAY FERNSTROM, ASC, "Hawaiian Eye"*

CARL BERGER, ASC, JACK MACKENZIE, ASC, REX WIMPY, ASC, RAY FERNSTROM, ASC, "Bourbon Street Beat"* with Andrea Duggan and Richard Long.

J PEVERELL MARLEY, ASC, RAY FERNSTROM, ASC, CARL BERGER, ASC, "Lawman"* with John Russell.

HAROLD STINE, ASC, EDWIN DUPAR, ASC, "77 Sunset Strip"* with Efrem Zimbalist, Jr

ELLSWORTH FREDRICKS ASC, "Tall Story" (Mansfield Prods.) with Anthony Perkins and Jane Fonda Joshua Logan, director

CARL GUTHRIE, ASC, WARREN LYNCH, WESLEY ANDERSON, "Colt 45"* with Wayde Preston.

CARL BERGER, ASC, JACK MACKENZIE, ASC, "Sugarfoot"* with Will Hutchins

RALPH WOOLSEY, ASC, REX WIMPY, ASC, CARL BERGER, ASC, "Bronco"* with Ty Hardin.

THOMAS TUTWILER, ASC, Commercials*

WALTER CASTLE, ASC, Commercials*

PEVERELL MARLEY, ASC, Commercials,* "Rachel Cade" with Peter Finch and Angie Dickinson. Gordon Douglas, director

HAL MOHR, ASC, Commercials*

ARTHUR FEINDEL, ASC, Commercials*

H F KOENEKAMP, ASC, Commercials*

SIMPLIFYING SYNC

Continued from Page 621

and is coupled directly to the magnetic phono preamplifier in the amplifier The bass control is set at minimum to reduce random hum pickup.

To summarize this system, as used for reproduction of picture and sound, the tape recorder feeds the sync control impulse to the sync amplifier. The amplified signal controls the sync motor that monitors the speed of the projector so that it operates in sync with the recorder, thus insuring absolute synchronism between picture and sound ■

FILM TREATMENT TIP

Motion picture films having the Minnesota Mining & Mfg. Company's laminated "Scotch Track" magnetic sound stripe require special care in cleaning.

Such films, according to a bulletin issued by The Calvin Company, Kansas City, Mo., should be cleaned *only* with a Freon-type cleaning fluid. Other liquid film cleaners have been known to loosen the adhesive bond between the stripe and the film. The bulletin also advises against winding laminated-stripe film on cores

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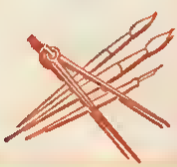
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